Original Article

Laparoscopic Ventral Rectopexy Using Biologic Mesh without Sigmoid Colon Resection for Full-thickness Rectal Prolapse: A 12-patient Case Series

Hsin-Yuan Hung[1]
Chun-Kai Liao[2]
Chih-Jung Chen[1]
Chun-Yi Wu[1]
Kun-Yu Tsai[1]

[1]*Division of Colon and Rectal Surgery, New Taipei Municipal TuCheng Hospital, New Taipei City,*
[2]*Division of Colon and Rectal Surgery, Chang Gung Memorial Hospital, Linkou, Taiwan*

Purpose. Ventral rectopexy is an effective treatment option for patients with full-thickness rectal prolapse. This study aimed to present the short-term surgical outcomes of laparoscopic ventral rectopexy using biologic mesh without sigmoid colon resection in patients with rectal prolapse.
Methods. This study was conducted between September 2020 and December 2023 and involved 12 patients. The inclusion criterion was complete rectal prolapse confirmed by taking pictures during colonoscopy examination or in the patient squeeze position. Preoperative assessments included colonoscopy or double-contrast lower-gastrointestinal imaging. The surgical techniques involved laparoscopic ventral rectopexy using biologic mesh (Biodesign® Hernia Graft; Cook Medical, Bloomington, IN, USA). Patients received regular follow-up for ≥ 6 months to evaluation surgical results.
Results. This study included 10 women and 2 men with a median age of 77.2 (range, 66-85) years and a mean body mass index of 23.2 (range, 18.3-27.5) kg/m^2. Two patients (16.7%) had previously undergone transperineal repair for rectal prolapse. The mean operative time was 225 ± 33 min. There was no postoperative mortality or major complication. The minor complication rate was 8.3% (1/12), with one patient experiencing pelvic infection and fever. We believe that the cause of the fever was a pelvic surgical-site infection related to the mesh foreign body. One patient (8.3%) experienced rectal prolapse recurrence during the follow-up and underwent a second surgery using the transperineal Delorme procedure.
Conclusions. Laparoscopic ventral rectopexy using a biologic mesh without sigmoid colon resection is a safe and effective approach in patients with full-thickness rectal prolapse.

[*J Soc Colon Rectal Surgeon* (*Taiwan*) *2025;36:177-185*]

Rectal prolapse, which mostly occur in older adults, often presents with symptoms, such as constipation or fecal incontinence. Rectal prolapse can be classified into internal and external types, with the external type further divided into mucosal prolapse and full-thickness prolapse.[1,2] Rectal prolapse causes discomfort; however, patients refrain from seeking medical attention owing to embarrassment, which leads to a

decline in their quality of life.

Surgery is one of the most effective strategies for completely treating rectal prolapse and can be performed via either perineal or abdominal approaches.[3] Perineal surgery carries lower risks, but may result in higher recurrence rates owing to limited resection or folding-only treatment, making it suitable for patients with less severe prolapse symptoms.[4,5] However, abdominal surgery yields better outcomes and comes in two forms: one involving sigmoid colon resection with rectal fixation and the other focusing solely on rectal fixation without sigmoid colon resection.[6,7]

Theoretically, sigmoid colon resection improves constipation symptoms but increases surgical risks and may not necessarily improve postoperative bowel movements.[8,9] Opting for rectal fixation without sigmoid colon resection reduces the risk of postoperative infections and complications, making it more suitable for older adultsand critically ill patients. Rectal fixation can be achieved by using direct suturing or external fixation devices.[10-12]

Traditional nonabsorbable materials for external fixation may lead to foreign-body inflammation, infections, or long-term complications such as mesh erosion or vaginal vault prolapse in females, thereby posing risks. Alternatively, using a bioabsorbable mesh reduces the risk of foreign-body reactions or migration. However, long-term studies are needed to assess its potential impact on the recurrence of rectal prolapse.

This study aimed to present the short-term surgical outcomes of laparoscopic ventral rectopexy using biologic mesh without sigmoid colon resection.

Material and Methods

Patients

Between September 2020 and December 2023, 12 patients with full-thickness rectal prolapse were enrolled in the study. Full-thickness rectal prolapse protruding outside the anus was confirmed and photographed during physical or colonoscopic examinations. Patients with mucosal prolapse were excluded from the study. Besides, there's a portion of patient who was critical ill that surgery cannot be performed and supportive treatment was suggested during study period.

All surgeries followed the same standard surgical procedure and used the same bioabsorbable mesh (Biodesign® Hernia Graft, 13 × 15 cm; Cook Medical, Bloomington, IN, USA) for rectopexy. None of the patients underwent sigmoid colon resection, even those with preoperative constipation. Surgical results and follow-up data were retrospectively collected through a chart review.

Preoperative evaluation and preparation

Eleven patients were referred from the outpatient department, and one patient came from the emergency department owing to acute incarceration of the prolapsed rectum. The clinical presentations of all patients, including symptoms, bowel movements, constipation, and incontinence, were recorded. Physical examination results, including those of abdominal and digital rectal examinations, were also documented. All patients underwent colonoscopy or double-contrast lower-gastrointestinal imaging to exclude colonic lesions. One day prior to the surgery, patients were asked to consume a clear liquid diet without the use of colon-preparatory laxatives to prevent small bowel edema. A Fleet enema was administered rectally the morning of the operation.

Patients were admitted to the hospital 1 day before surgery. Upon admission, medical and surgical histories were reviewed, and evaluations including chest radiography, electrocardiography, and blood tests (complete blood count, liver function, renal function, and electrolytes) were performed. Two-dimensional echocardiography and/or pulmonary function tests were completed in patients with heart or lung disease, or in those aged > 75 years.

Operative procedure

In the operating room, under general anesthesia, the patient was placed in the lithotomy position with the right side down and the head tilted 30° downward. Using three-dimensional laparoscopy, four trocars were

inserted: two 12-mm trocars at the umbilicus and right lower quadrant, and two 5-mm trocars in the right upper quadrant and left upper quadrant. Tissue dissection was performed using electric scissors only, as no energy device was needed owing to the absence of major vessel divisionsduring this surgery.

Operative steps

1. The uterus was suspended for female patients.
2. The peritoneum was incised along the left side of the pararectal space up to the lower pelvic peritoneal reflection (Fig. 1A).
3. Total mobilization of the anterior, right, and left parts of the rectum below the peritoneal reflection was performed to the level of the levator ani (Fig. 1B).
4. Fixation of biologic mesh: The mesh was fixed to the dissected rectal wall with eight sutures using 3-0 polydioxanone (PDS), and the upper part of the mesh was secured to the superficial fascia of the presacral promontory with two sutures using 2-0 PDS. We ensured that the prolapsed rectum was

successfully lifted without prolapse, and that the mesh tension was appropriate (Fig. 1C).
5. The peritoneum was closed using 3-0 V-LOC® Suture, and a Jackson-Pratt (J-P) drain was placed (Fig. 1D). The fascia was closed at the 12-mm trocar sites. The nasogastric tube was removed immediately after the surgery in the operating room.

Postoperative care

On postoperative day 1, the patients were maintained on a clear liquid diet. Oral acetaminophen was administered four times daily for pain management. Most patients tolerated the wound pain and did not require injectable pain medications. On the postoperative day 1, if the patient passed gas, they were allowed to consume a soft or full diet. At this stage, the Foley catheter could be removed, antibiotics could be discontinued, and patients were encouraged to ambulate to aid recovery. Between postoperative days 2 and 3, the J-P drain was removed.

Patients were discharged from the hospital on day 4 or later if they did not experience any discomfort or
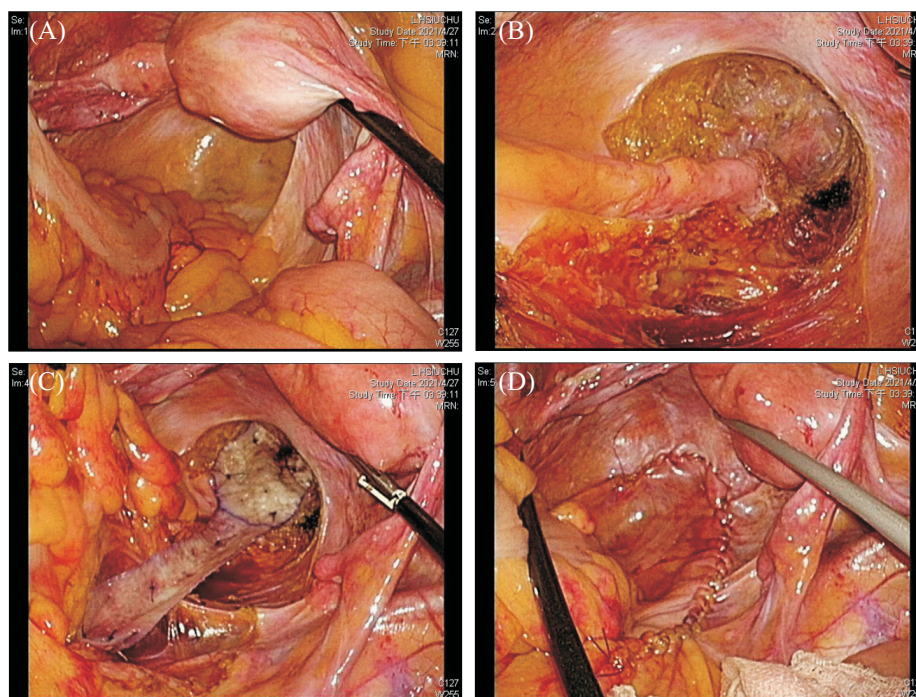

Fig. 1. (A) Suspension of uterus. (B) Incision of peritoneum and dissection extraperitoneal rectum. (C) Fixation of biologic mesh to rectum and sacral promontory. (D) Closure of peritoneum.

signs of infection. Patients were followed up in the outpatient department for at least 6 months to monitor their recovery progress. Fig. 2 shows images of one patient with rectal prolapse before treatment (Fig. 2A) and after treatment (Fig. 2B).

Results

There were 10 female and 2 male patients with a mean age of 77.3 (range, 66-85) years. The mean body mass index was 23.2 (range, 18.3-27.5) kg/m^2. Two patients (16.7%) had previously undergone transperineal repair for rectal prolapse. All patients underwent laparoscopic ventral rectopexy without sigmoid colon resection. 91% of the rectal prolaspe was grade IV and only one patient had grade III prolapse in this cohort.[13]

The American Society of Anesthesiologists (ASA) physical status score was used to evaluate operative risk. There were nine patients with ASA 2 (75%) and three with ASA 3 (25%). Most of the patients had comorbidities. Comorbidities included hypertension (58.3%), cardiac disease (33.3%), stroke (16.7%), diabetes mellitus (41.7%), and end-stage renal disease (8.3%) (Table 1).

The mean operative time was 225 ± 33 min. None of the patients required a conversion to open surgery. Two patients had longer operative times (> 320 min) because of severe pelvic small bowel adhesions from

Fig. 2. (A) The picture of pre-treatment full-thickness rectal prolapse. (B) The picture of post-treatment rectal prolapse.

previous gynecological procedures. The mean blood loss was 55 ml (range, 5-500 ml). Blood loss was minimal (< 10 ml) in most patients. However, one patient experienced 500 ml of blood loss owing to perioperative bleeding during suture fixation of the mesh to the promontory. The bleeding was successfully controlled by compression and resuturing of the bleeder vessel. No surgical mortality was observed in this study. No major complications such as cardiopulmonary events, postoperative surgical bleeding, or delayed ileus were observed. The mean length of the postoperative hospital stay was 4.3 days (range, 3-6 days).

The overall complication rate was 8.3% (1/12). One patient returned to the emergency department on the 3rd day after discharge because of fever, and a pelvic surgical site infection related to the mesh foreign body was suspected. This patient required readmission and showed clinical improvement one day later after receiving systemic antibiotics. She was discharged 3 days after readmission and experienced no further symptoms during follow-up (Table 2).

Outcomes after ventral mesh rectopexy

No patients experienced postoperative anal incontinence, abdominal pain, or intestinal obstruction. Eight patients had constipation before surgery; of these, four (50%) experienced a partial improvement in constipa-
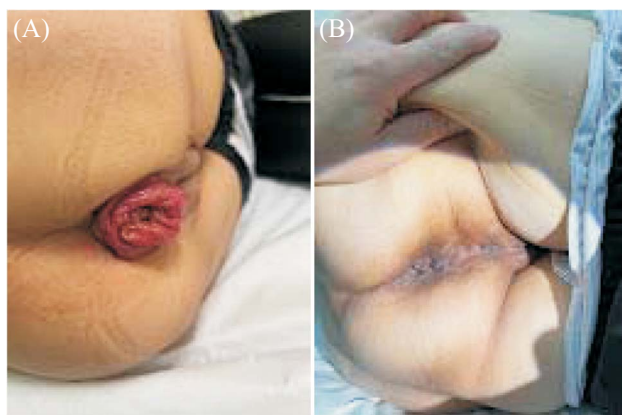
Table 1. Characteristics of the enrolled patients (N = 12)

	Median or number (%)
Median age	77.2 (66-85 years)
Sex	
Female	10 (83.3%)
Male	2 (16.7%)
Median BMI	23.2 (18.3-27.5)
Comorbidity	
Hypertension	7 (58.3%)
Cardiac disease	4 (33.3%)
Stroke	2 (16.7%)
Diabetes mellitus	5 (41.7%)
End stage renal disease	1 (8.3%)
ASA	
2	9 (75.0%)
3	3 (25.0%)
Previous abdominal surgery	3 (25.0%)
Previous perineal repair	2 (16.7%)

Table 2. Operative outcomes

	Median (range) or No. of patients (%)
Operative times	280 min (130-330 min)
Blood loss (mL)	55 cc (5-500 cc)
Post-surgery admission days	4.3 days (3-6 days)
Mortality	0 (0%)
Major complication	0 (0%)
Minor complication	
Surgical site infection	1 (8.3%)
Urinary retention	0 (0%)
Post operative ileus	0 (0%)
Total complication rate	1/12 (8.3%)
Re-admission	1/12 (8.3%)
Conversion to open surgery	0 (0%)
Rectal prolapse recurrence	1/12 (8.3%)

tion, while the other four (50%) showed no improvement and still required regular laxatives. None of the patients complained of foreign body sensation in the rectum. According to chart, eleven patients did not experience any rectal prolapse after surgery, excpet one male patient experienced recurrent rectal prolapse during postoperative follow-up, resulting in a recurrence rate of 8.3% (1/12). He underwent a second surgery using the transperineal Delorme method eight months after the first surgery. Recurrence of rectal prolapse was not observed after the second surgery.

Discussion

Weakness of the pelvic floor muscles due to age, chronic constipation, or previous pelvic surgery can weaken the supporting structures of the rectum. Chronic straining during bowel movements increases pressure on the rectum, contributing to the development of rectal prolapse.[14] Other causes include connective tissue disorders or neurological disorders, which disrupt the normal functioning of the pelvic floor.[15,16] Nonsurgical treatment options include lifestyle modifications, such as increasing daily activities and pelvic muscle training, long-time defecation squeeze position, and pharmacological interventions such as laxatives to correct constipation and optimize bowel movement.

Surgical treatment via the perineal approach includes the Delorme and Altemeier procedures. These methods have a low complication rate but a higher recurrence rate, making them suitable for older or high-risk patients with less severe prolapse.[17,18]

Surgical treatment using the abdominal approach includes rectopexy with or without sigmoid colon resection. These procedures, which can be performed using open, laparoscopy-assisted, or robot-assisted methods, typically offer lower recurrence rates, but involve higher initial surgical risks and longer recovery periods. Minimally invasive approaches, including both laparoscopy and robotic techniques, offer advantages such as smaller wounds, less pain, and faster recovery compared to traditional open surgery, and are becoming more common owing to their reduced recovery times and overall complications. Patients could benefit from getting out of bed quickly and startconsuming soft foods the day after surgery,[19,20] making such procedures preferrable for patients without significant comorbidities.

Table 3 summarizes the comparison between the transperineal and transabdominal approaches for rectal prolapse surgery, including recurrence rates, complications, and overall outcomes.[21-24] These findings help determine the most appropriate surgical intervention based on the patient's condition, risk factors, and desired outcomes. Each method has specific indications, advantages, and potential risksthat should be carefully considered by the surgical team.

Rectopexy with sigmoid resection has a lower recurrence rate and is particularly beneficial in patients with concomitant constipation. However, higher complication rates due to additional bowel resection are a concern, particularly for anastomotic leakage, which may require temporary or permanent colostomy. This method is often used only in patients with severe constipation and prolapse. The laparoscopic method pro-

Table 3. Compare perineal approach and abdominal approach[18-21]

Surgical approach	Recurrence rate	Complication rate
Altemeier procedure	16-30%	5-15%
Laparoscopic rectopexy	2-10%	10-16%
Rectopexy with sigmoid resection	3-5%	16-20%

vides a balance between efficacy and safety, with lower recurrence and moderate complication rates. Laparoscopic ventral rectopexy without sigmoid colon resection for full rectal prolapse is safe, especially in older patients and those with multiple comorbidities. Our approach uses only a bioabsorbable mesh for rectal fixation without resecting the sigmoid colon, maintaining bowel function or avoiding infection or leakage at the anastomosis site. Although some studies recommend sigmoid resection along with rectal fixation to prevent the worsening of postoperative constipation, in older adult patients with multiple comorbidities, avoiding bowel resection can significantly reduce surgical complications and postoperative infections. In our study, the patients did not experience worsening bowel difficulties postoperatively.

Another minimally invasive option is Da Vinci (Intuitive Surgical, Sunnyvale, CA, USA) robotic surgery, which offers advantages in maneuvering instruments flexibly during deep pelvic biological mesh suturing, making the process easier and faster. Previous studies suggest that robotics may have more advantages in deep and narrow pelvic areas.[25] We performed laparoscopic surgery for all patients primarily due to cost considerations and a previous review that revealed no significant difference in conversion rates between laparoscopic and robotic rectopexy.[26] In Taiwan, the National Health Insurance does not cover Da Vinci surgery, requiring patients to bear the high costs themselves, which can be a significant financial burden for most older adult patients. Skilled surgeons can successfully perform deep pelvic suturing by using traditional laparoscopy.

Clinically, the two most common issues associated with rectal prolapse are the sensation of anal swelling and foreign objects and bowel movement problems, including constipation, incomplete evacuation, and anal leakage. In our study, the postoperative symptoms improved in all patients. We believe that most of the patients with preoperative constipation will experience improvements with laparoscopic rectal fixation. Although this improvement of constipation may be greater with sigmoid resection, this procedure increased the risk of anastomotic complications and disrupts normal bowel peristalsis.

Among the 12 patients, only one male patient experienced partial rectal prolapse recurrence during the observation period and achieved symptom improvement through anal surgery. This analysis suggests that this patient underwent surgery during the acute phase of rectal prolapse when the tissue was likely edematous. Additionally, the narrower male pelvis may have contributed to difficulty in accurately suturing the lowest point of the biological mesh. Improvements could include avoiding surgery during the acute phase and considering Da Vinci surgery in challenging cases involving a narrower pelvic anatomy to facilitate easier low-pelvic rectal suturing.

Permanent meshes provide long-term mechanical support, potentially decreasing long-term hernia recurrence rates compared to biological meshes. However, the advantage of biological mesh is the reduced risk of residual foreign body reactions in the pelvic tissue, such as surgical-site infections, chronic inflammation, or foreign-body erosion, which can even cause bowel or vaginal perforation.[27] Clinical concerns about prolapse recurrence after the absorption of biological mesh have not been substantiated, as studies show no significant difference in recurrence rates between biological and synthetic meshes. A review by Schans reported a cumulative incidence of 6.1% in synthetic mesh and 5.8% in biological mesh.[28] Mesh-related complications were reported in a study by Balla, who reviewed eight studies and found lower biological mesh erosion rates than synthetic mesh (1.87% in synthetic mesh and 0.22% in biological mesh).[29] The choice between bioabsorbable and nonabsorbable meshes should be considered according to the patient's situation.[30,31]

Limitations

This study had some limitations. First, this was a single-hospital retrospective study. We look forward to enrolling more patients and gaining experience in the future. Secondly, the follow-up period was not long enough; therefore, we could not determine the long-term recurrence rate of rectal prolapse. These patients should be followed up for long periods in clinics.

Conclusions

Herein, we present the surgical results of 12 patients with rectal prolapse. We treated the patient using a biological mesh for laparoscopic ventral rectopexy without sigmoid colon resection. The results showed that the operative risk and outcomes were acceptable, there was no need for colostomy, and there was a low recurrence rate duringthe observation period. We concluded that this is an acceptable choice for older patients with full-thickness rectal prolapse.

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原　　著

使用生物網片腹腔鏡腹直腸固定術 (不進行乙狀結腸切除) 治療全層直腸脫垂：12 例患者病例分析

洪欣園 [1]　廖俊凱 [2]　陳志榕 [1]　吳俊毅 [1]　蔡坤佑 [1]

[1] 新北市立土城醫院　大腸直腸外科
[2] 林口長庚紀念醫院　大腸直腸外科

目的　腹腔鏡直腸固定術是治療全層直腸脫垂患者的有效治療方法。本研究介紹對直腸脫垂患者進行腹腔鏡生物可吸收網膜直腸固定術無乙狀結腸切除的短期手術結果。

方法　於 2020 年 9 月至 2023 年 12 月期間，共收錄 12 名直腸脫垂患者。術前評估包括結腸鏡檢查或下消化道攝影。評估手術前後臨床特徵和手術後結果。所有病人皆接受腹腔鏡生物可吸收網膜直腸固定術。病人持續追蹤至少六個月用以評估手術結果。

結果　本研究納入 10 例女性和 2 例男性患者，中位年齡為 77.2 歲 (範圍 66-85)，平均體重指數為 23.2 kg/m^2 (範圍 18.3-27.5)。2 例 (16.7%) 曾接受過直腸脫垂經會陰修復術。平均手術時間為 225 (±33) 分鐘，無術後死亡率或重大併發症。一位病患出院後發燒再入院，疑似生物可吸收網膜引起相關骨盆腔感染，輕微併發症發生率為 8.3% (1/12)。一名男性患者 (8.3%) 在追蹤期間出現直腸脫垂復發，並使用經會陰 Delorme 手術進行了第二次手術。

結論　本研究顯示使用生物可吸收網膜進行腹腔直腸固定術而不進行乙狀結腸切除是一種治療直腸脫垂安全有效的方法。

關鍵詞　直腸脫垂、腹腔鏡、生物可吸收網膜直腸固定。