

## Laparoscopic Natural Orifice Specimen Extraction (NOSE) Total Colectomy with Ileorectal Anastomosis: A Case Report and Literature Review

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### Abbreviations:

NOSE: Natural orifice specimen extraction; FAP: Familial adenomatous polyposis; TVSE: Transvaginal specimen extraction; TASE: Transanal specimen extraction

### Keywords:

Natural orifice specimen extraction; Total colectomy

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## 1. Abstract

**1.1. Background:** The benefit of laparoscopic surgery in terms of reduced pain and fewer cosmetic problems is not always obvious, and surgeons continue to seek the best ways to limit incision trauma and improve outcomes in laparoscopic colorectal surgery.

**1.2. Case Presentation:** A 32-year-old woman presented with anemia. At colonoscopy there were multiple polyps of the whole colon with highly atypical hyperplasia, and she was diagnosed with familial adenomatous polyposis (FAP). Because of her increased risk of colon cancer, a laparoscopic total colectomy was performed. After completely freeing the entire colon, the colon was pulled out from the open end of the rectum through the anus and the terminal ileum was extracorporealized through the rectum. An end-to-end anastomosis (EEA) anvil was purse stringed into the end of ileum and then placed back into the abdomen. The rectal stump was closed with a 60-mm blue-load linear stapler and the EEA stapler was then inserted into the rectum to establish a double anastomosis between the terminal ileum and the rectum. A lymphatic leak that developed on postoperative day 5 was resolved after conservative treatment, and the patient was finally cleared for hospital discharge on postoperative day 14. During the first 3 months postoperatively, she has been having 3 to 4 daily bowel movements. We searched the PubMed database and reviewed the literature on natural orifice

specimen extraction (NOSE) in laparoscopic total colectomy.

**1.3. Conclusions:** Scarring was barely visible on the abdominal wall after NOSE surgery, potentially ameliorating incision-related patient distress. Laparoscopic surgery with NOSE is a developing technique with potential as an option for minimally invasive colon cancer surgery.

## 2. Introduction

Over the past 30 years, laparoscopic colorectal surgery has been accepted as a less invasive procedure that is technically feasible and safe [1]. Not only is the incision burden reduced, but the field of view is enlarged, making the procedure more delicate than traditional open surgery. However, surgical complications and incision pain, particularly associated with wounds made for the specimen extraction, are persistent problems for laparoscopic surgeons [2]. Reducing the risk of wound complications and postoperative incisional hernia remains an essential goal of laparoscopic surgery [3]. Recent innovative procedures and new technologies toward advancing this goal include natural orifice specimen extraction (NOSE). NOSE via transanal specimen extraction (TASE) [4] and transvaginal specimen extraction (TVSE) [5] has yielded valuable therapeutic results in patients with gastrointestinal disease. However, to date, NOSE techniques for total colectomy are rarely re-

ported [4, 6]. Here, we describe a laparoscopic total colectomy with TASE in a patient with familial adenomatous polyposis (FAP). We also present a review of recent literature on NOSE total colectomy, providing some objective recommendations for the future.

### 3. Case Presentation and Literature Review

A 32-year-old woman presented with anemia. Colonoscopy revealed multiple polyps of the whole colon with highly atypical hyperplasia, and the patient was diagnosed with familial adenomatous polyposis (FAP) (Figure 1a). Although the diagnosis was familial polyposis, the patient had relatively few polyps in the rectum and could be removed colonoscopically. In addition, she wanted to have children in the future, so the patient underwent laparoscopic total colectomy with ileorectal anastomosis (TC-IRA) and NOSE.

#### 3.1. Surgical technique

First, the left colon was mobilized in a medial-to-lateral approach. The inferior mesenteric artery was then high ligated (Figure 1b) and the splenic flexure of the colon was then completely freed to the whole circumference of the rectum.

A medial approach was then used to free the terminal ileum, cecum, and ascending colon.

The ileocolonic vessels were ligated by using a high ligation method (Figure 1c) and the remaining attachments between the transverse colon and omentum were dissected, followed by ligation of the middle transverse colon vessels (Figure 1d).

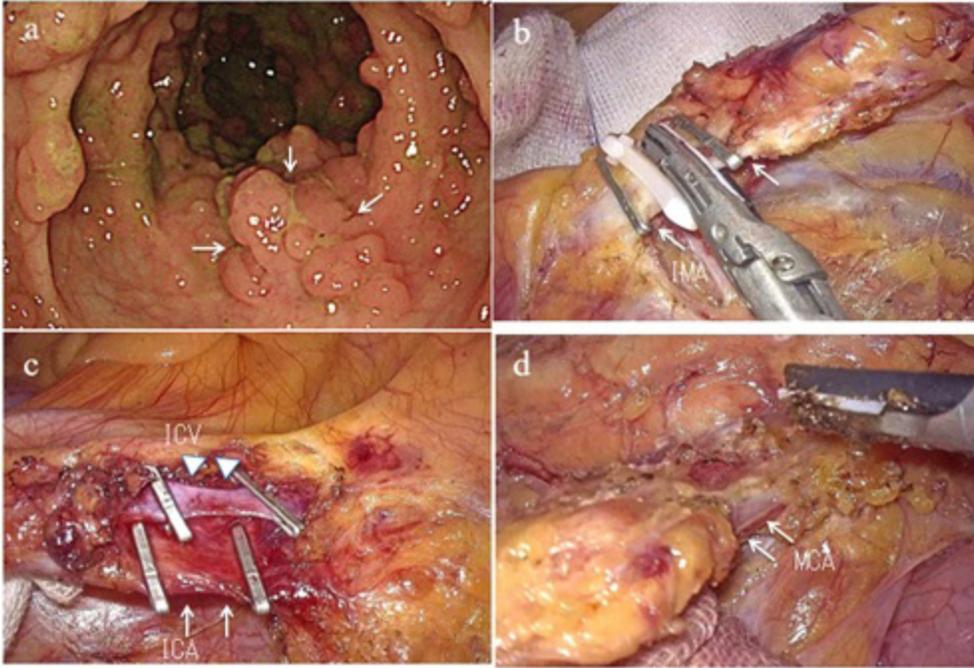
The rectosigmoid junction was identified below the sacral promontory and the distal intestine was transected at this point by using a 60-mm linear stapler (Blue cartridge, Ethicon, Johnson & Johnson, USA). The rectal stump was thoroughly washed with one liter of saline diluted with 5% iodine. The distal end of the rectum was then opened with an ultrasound energy device and disinfected with iodine gauze (Figure 2a). A specimen bag was inserted into the abdominal cavity via the 12-mm trocar and secured outside the anus with oval forceps to protect the rectal mucosa from potential tumor seeding (Figure 2b). The proximal end of the rectum was closed again with the oval forceps until the entire colon was pulled

out through the anus (Figure 2c).

The terminal ileum was extracorporealized through the rectum (Figure 3a) and an end-to-end anastomosis (EEA) anvil was purse stringed into the end of ileum and then placed back into the abdomen (Figure 3b). The rectal stump was closed with a 60-mm blue-load linear stapler (Figure 3c). The EEA stapler was then inserted into the rectum to establish a double anastomosis technique between the terminal ileum and the rectum (Figure 3d). Postoperatively, the patient developed lymphatic leakage when feeding on postoperative day 5, which was improved after an additional week of fasting. She was finally discharged on postoperative day 14. Except for the healing of the scar at the location of the drainage tube, the remaining abdominal incisions were less obvious (Figure 4a). At the third month after the operation, the patient was having 3 to 4 bowel movements daily.

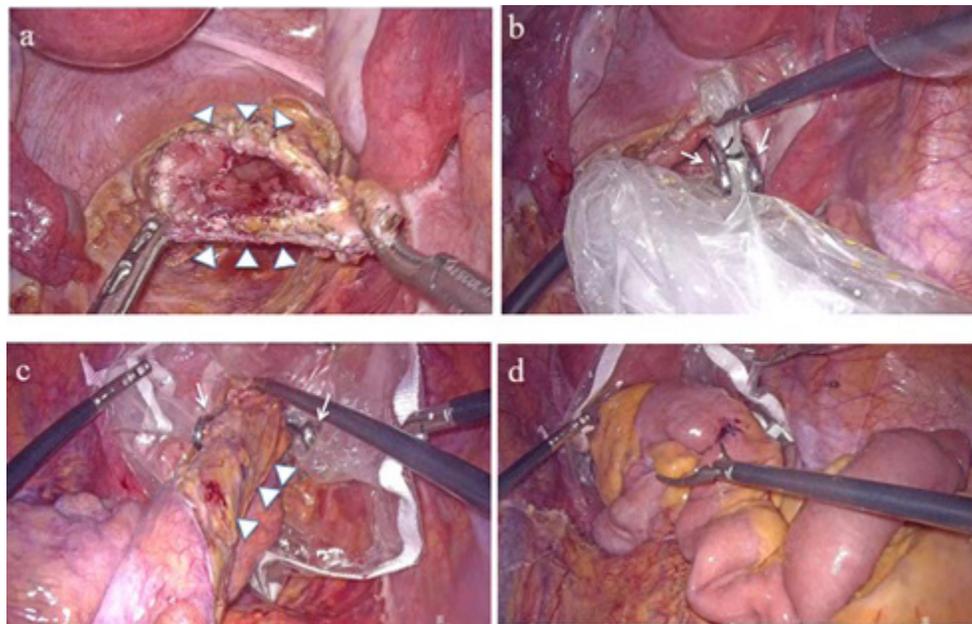
The patient had multiple polyps throughout the entire colon, of which the larger lesions measured approximately  $4.5 \times 3.5 \times 3$  cm. Polyps are mainly concentrated in the transverse colon and descending colon, and relatively few in the cecum and rectum (Figure 4b). The microscopic examination showed a diffuse distribution of tubular villous adenomas and tubular adenomas in the entire colon with a small number of scattered mulberry scales. The pathology findings suggested colorectal adenoma accompanied by intramucosal dysplasia (Figure 4c). A total of 225 lymph nodes were also dissected and none had metastases.

We performed a search for papers indexed in PubMed by the terms total colectomy and NOSE and found 8 papers with a total of 26 patients, 17 female and 9 males. NOSE was carried out by TVSE in 4 female patients who were over the age of 40 years and via TASE in all the others ( $n=22$ )[7-9]. In general, NOSE seemed to be suitable for patients with benign disease. Among 26 cases, 17 patients had colon polyposis, 6 had colon dysfunction[8, 10-12], and 3 had colon tumors[13]. End-to-end anastomoses were possible in most of the patients. The most frequent postoperative complication was intestinal obstruction, followed by intra-abdominal abscess (2 patients) and anastomotic leak (1 patient) (Table 1).



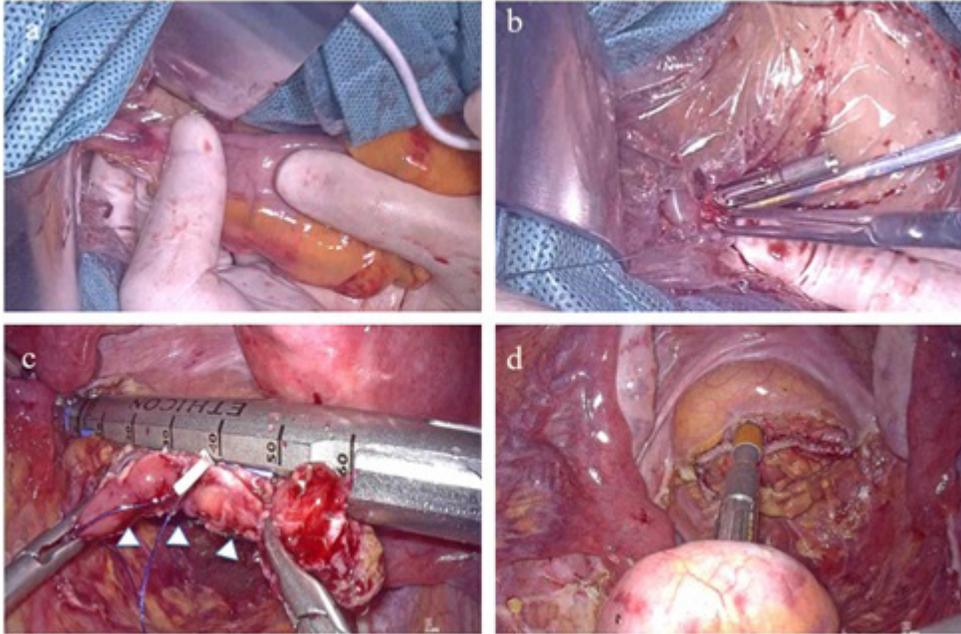
**Figure 1:** Preoperative and intraoperative images

- (a) Colonoscopy revealed multiple polyps throughout the colon. The larger polyps measured approximately 4.5 cm (white arrows).  
 (b) The sigmoid colon was freed by a medial approach and the inferior mesenteric artery ( IMA ) was severed (white arrows).  
 (c) A medial approach was used to free the right colon and cut off ileocolonic vein (ICV) (white arrowheads) and the ileocolonic artery (ICA) (white arrows).  
 (d) The Middle colonic arteries (MCA) (white arrows) was divided, and the colon was completely freed.



**Figure 2:** Intraoperative images

- (a) The distal end of the rectum was opened with an ultrasound energy device (white arrowheads).  
 (b) The specimen bag was inserted into the abdominal cavity from the 12-mm trocar and clipped out of the anus with oval forceps to protect the rectal mucosa from potential tumor seeding (white arrows).  
 (c) The proximal end of the rectum was pinched out with the oval forceps (white arrowheads).  
 (d) The end of the ileum was pulled out along the distal rectum.



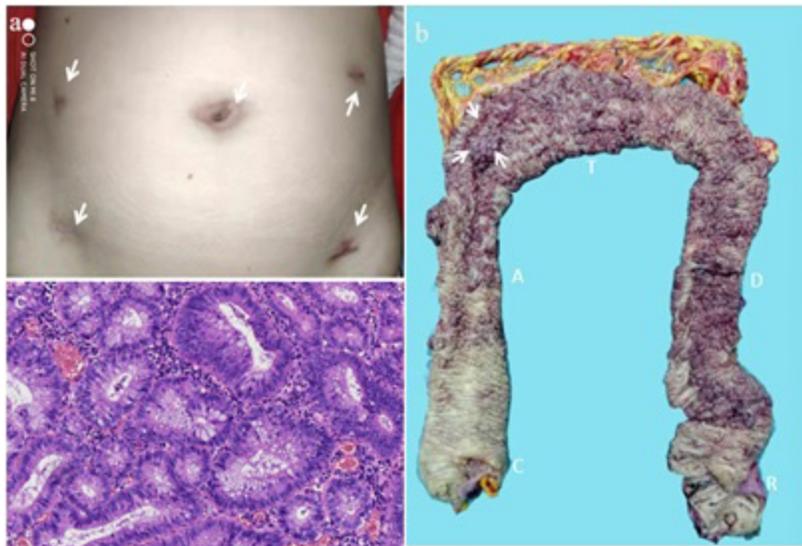
**Figure 3:** Extracorporeal manipulation and intracorporeal anastomosis

(a) The terminal ileum was extracorporealized through the rectum.

(b) The end of ileum was sutured with purse strings, and the circular end-to-end anastomosis (EEA) stapler was inserted into the abdominal cavity.

(c) The distal end of the rectum was closed again with a linear stapling device (white arrowheads).

(d) The EEA stapler was then inserted into the rectum to establish a double anastomosis between the terminal ileum and the rectum.



**Figure 4:** Resected specimen and pathology findings.

(a) Cosmetic appearance after total laparoscopic colectomy. The arrows indicate the sites of trocar insertion.

(b) Multiple polyps in the colon. The larger polyps measured approximately  $4.5 \times 3.5 \times 3$  cm (white arrows). Polyps are mainly concentrated in the transverse colon and descending colon, and relatively few in the cecum and rectum (C: cecum; A: ascending colon; T: transverse colon; D: descending colon; R: rectum).

(c) The microscopic examination showed that diffusely distributed tubular villous adenomas and tubular adenomas throughout the colon, with a few scattered mulberry scales (hematoxylin and eosin [HE],  $\times 40$ ).

**Table 1:** Review of total colectomy with ileorectal anastomosis and natural orifice specimen extraction.

No.	Year	Age	Gender	Indication, case (n)	Anastomosis	Extraction method	Complication	References
1	2008	53	Female	Hereditary non-polyposis coli (1)	End-to-end	Transvaginal	Ileus	Dozois et al. <sup>5</sup>
2	2012	27	Female	Colonic inertia (1)	End-to-side	Transanal	NA	Awad et al. <sup>10</sup>
3	2013	65	Female	Constipation (1)	NA	Transvaginal	None	Rodríguez et al. <sup>6</sup>
4	2014	40	Female	polyposis coli & Sigmoid cancer(1)	End-to-side	Transvaginal	None	Awad et al. <sup>14</sup>
5	2016	NA	Female	Constipation (1)	End-to-side	Transanal	NA	Fan et al. <sup>11</sup>
6	2017	63	Male	FAP (1)	Side-to-side	Transanal	SSI	Gundogan et al. <sup>18</sup>
		42	Female	FAP (1)	End-to-side		Ileus	
7	2019	41.9 (average age)	Female (6)	FAP (10) Colonic tumor (3)	End-to-end (10)	Transanal (12) Transvaginal (1)	Abdominal abscess (2)	Gundogan et al. <sup>13</sup>
			Male (7)		Side-to-side (3)		fistula (2) Ileus (1) hemorrhage (1) Pouchitis (1)	
8	2020	24	Female	FAP (1)	End-to-end	Robotic	leakage	T.-C. Chen et al. <sup>12</sup>
		27	Female	Colonic inertia (1)	End-to-end	Transanal	Ileus	
		34	Male	FAP (1)	End-to-end		None	
		26	Female	Colonic inertia (1)	End-to-end		Ileus	
		42	Female	Colonic inertia (1)	End-to-end		None	
9	2022	32	Female	FAP (1)	End-to-end	Transanal	Lymphatic leakage	Wang. et al.

FAP: Familial adenomatous polyposis

#### 4. Discussion

Improvements in laparoscopic techniques and instrumentation have dramatically changed the landscape of laparoscopic surgery over the past three decades. However, most laparoscopic surgeries still require a small incision in the abdominal wall to remove the excised specimen [7].

During abdominal surgery, the fascial incision is much larger than the skin incision. The length of the skin incision for general laparoscopic colectomy is 3 to 5 cm, and the length of the incision is 6 to 8 cm in hand-assisted laparoscopic surgery [13]. Incision-related complications, mainly infection and postoperative hernia or incisional pain, have been a persistent problem that surgeons must face in laparoscopic colectomy.

NOSE via TASE or TVSE eliminates the need for additional abdominal wall incisions for specimen extraction or anastomosis. Along with reducing the potential for wound complications, the smaller incision burden also improves cosmetic results and reduces postoperative pain [14].

Vaginal incision has been controversial because of the risk of complications impacting sexual function and pregnancy-readiness [15-17]. Our literature review showed that among 17 female patients, TVSE was chosen only in 4 who were over the age of 40 years. Thus, to minimize adverse effects on reproductive function, surgeons may prefer TVSE only in older women.

There are some risks associated with NOSE total colectomy. First,

the requirement for an intra-abdominal dissection of the rectum might increase the risk of abdominal infection, and preoperative mechanical bowel preparation is required in all patients. Second, if the mesenteric membrane is too thick, it may cause tearing of the rectum or vagina. If this happens, the NOSE should be decisively terminated and replaced by a routine abdominal incision to remove the specimen.

Postoperative intestinal obstruction was the most common complication after total colectomy, which may be related to the large wound surface. It may be necessary to properly introduce biological materials that prevent adhesion.

In our case, preoperative computed tomography showed many lymph nodes, and 225 lymph nodes were dissected. Although all the lymph nodes were negative, the patient had a postoperative lymphatic leak. To reduce the occurrence of lymphatic leakage, it may be better to coagulate lymphatic vessels at the mesenteric root with an energy coagulation device.

With more widespread application of robotic surgery, robot-assisted total colectomy may also be gradually promoted in the future [12]. Compared with conventional laparoscopy, robot-assisted procedures introduce advantages such as high joint mobility and stable operation, and it is expected that a robotic approach to NOSE surgery could benefit patients even more [12].

Familial adenomatous polyposis (FAP) is often associated with early malignant transformation, and surgeons should consider rad-

ical resection of lymph nodes when performing total colectomy in FAP. Currently, NOSE is mainly used in laparoscopic total colectomy when it is performed for the treatment of benign colorectal lesions or the removal of smaller colon tumors, especially in younger female patients [13, 18]. This is largely due to concern over tumor seeding in the abdominal cavity while the colon is being pulled out through the natural orifice. However, a few authors have recently applied the technique with good efficacy even in radical surgeries for advanced ascending colon cancer [19]. Additional prospective multicenter clinical studies are expected for the long-term prognosis of NOSE surgery in advanced colorectal cancer.

## 5. Conclusion

By minimizing visible scarring on the abdominal wall, NOSE surgery may reduce the potential for psychological trauma caused by incisions. NOSE surgery is a developing technology that might become an option for laparoscopic colon cancer surgery in the future.

## References

1. Hashiguchi Y, Muro K, Saito Y, et al. Japanese Society for Cancer of the Colon and Rectum (JSCCR) guidelines 2019 for the treatment of colorectal cancer. *Int J Clin Oncol.* 2020; 25(1): 1-42.
2. Wolthuis AM, Fieuws S, Van Den Bosch A, de Buck van Overstraeten A, D'Hoore A. Randomized clinical trial of laparoscopic colectomy with or without natural-orifice specimen extraction. *Br J Surg.* 2015; 102(6): 630-7.
3. Franklin ME, Jr., Ramos R, Rosenthal D, Schuessler W. Laparoscopic colonic procedures. *World J Surg.* 1993; 17(1): 51-6.
4. Inoue Y, Noro H, Komoda H, et al. Completely laparoscopic total colectomy for chronic constipation: report of a case. *Surg Today.* 2002; 32(6): 551-4.
5. Dozois EJ, Larson DW, Dowdy SC, Poola VP, Holubar SD, Cima RR. Transvaginal colonic extraction following combined hysterectomy and laparoscopic total colectomy: a natural orifice approach. *Tech Coloproctol.* 2008; 12(3): 251-4.
6. Rodriguez-Zentner H, Juarez H, Rios J, Caceres M, Lopez JC. Total colectomy with transvaginal specimen extraction due to colonic inertia. *Rev Gastroenterol Mex.* 2014; 79(2): 153-4.
7. Palanivelu C, Rangarajan M, Jategaonkar PA, Anand NV. An innovative technique for colorectal specimen retrieval: a new era of "natural orifice specimen extraction" (N.O.S.E). *Dis Colon Rectum.* 2008; 51(7): 1120-4.
8. Leung AL, Cheung HY, Fok BK, Chung CC, Li MK, Tang CN. Prospective randomized trial of hybrid NOTES colectomy versus conventional laparoscopic colectomy for left-sided colonic tumors. *World J Surg.* 2013; 37(11): 2678-82.
9. Awad Z. Laparoscopic total colectomy with transvaginal extraction of the colon and ileorectal anastomosis. *Ann Surg Oncol.* 2014; 21(9): 3029.
10. Awad ZT. Laparoscopic subtotal colectomy with transrectal extraction of the colon and ileorectal anastomosis. *Surg Endosc.* 2012; 26(3): 869-71.
11. Fan WC, Huang CC, Sung A, Hsieh JS. Laparoscopic total colectomy with transrectal specimen extraction and intraabdominal ileorectal anastomosis for slow-transit constipation (with video). *J Vis Surg.* 2016; 153(4): 309-10.
12. Chen TC, Liang JT. Robotic natural orifice specimen extraction (NOSE) total colectomy with ileorectal anastomosis: a step-by-step video-guided technical note. *Tech Coloproctol.* 2020; 24(1): 79-84.
13. Gundogan E, Kayaalp C, Gunes O, Uylas U, Sumer F. A Comparison of Natural Orifice Versus Transabdominal Specimen Extraction Following Laparoscopic Total Colectomy. *J Laparoendosc Adv Surg Tech A.* 2019; 29(4): 471-475.
14. Awad ZT, Griffin R. Laparoscopic right hemicolectomy: a comparison of natural orifice versus transabdominal specimen extraction. *Surg Endosc.* 2014; 28(10): 2871-6.
15. Ghezzi F, Raio L, Mueller MD, Gyr T, Buttarelli M, Franchi M. Vaginal extraction of pelvic masses following operative laparoscopy. *Surg Endosc.* 2002; 16(12): 1691-6.
16. Paraiso MF, Barber MD, Muir TW, Walters MD. Rectocele repair: a randomized trial of three surgical techniques including graft augmentation. *Am J Obstet Gynecol.* 2006; 195(6): 1762-71.
17. Diana M, Perretta S, Wall J, et al. Transvaginal specimen extraction in colorectal surgery: current state of the art. *Colorectal Dis.* 2011; 13(6): e104-11.
18. Gundogan E, Aktas A, Kayaalp C, Gonultas F, Sumer F. Two cases of laparoscopic total colectomy with natural orifice specimen extraction and review of the literature. *Wideochir Inne Tech Maloinwazyjne.* 2017; 12(3): 291-296.
19. Kong FB, Deng QM, Deng HQ, et al. Propensity score-matched comparison between totally laparoscopic right hemicolectomy with transcolonic natural orifice specimen extraction and conventional laparoscopic surgery with mini-laparotomy in the treatment of ascending colon cancer (with video). *Gastrointest Endosc.* 2021; 94(3): 642-50.