

Clinical Trials Study

Laparoscopic right-sided colonic resection with transluminal colonoscopic specimen extraction

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Abstract

AIM: To study the transcolonic extraction of the proximally resected colonic specimens by colonoscopic assistance at laparoscopic colonic surgery.

METHODS: The diagnoses of our patients were Crohn's disease, carcinoid of appendix and adenocarcinoma of cecum. We preferred laparoscopic total mesocolic resections. Colon and terminal ileum were divided with endoscopic staplers. A colonoscope was placed per anal and moved proximally in the colon till to reach the colonic closed end under the laparoscopic guidance. The stump of the colon was opened with laparoscopic scissors. A snare of colonoscope was released and the intraperitoneal complete free colonic specimen was grasped. Specimen was moved in to the colon with the help of the laparoscopic graspers and pulled gently through the large bowel and extracted through the anus. The open end of the colon was closed again and the ileal limb and the colon were anastomosed intracorporeally with a 60-mm laparoscopic stapler. The common enterotomy orifice was closed in two layers with a running intracorporeal suture.

RESULTS: There were three patients with laparoscopic right-sided colonic resections and their specimens were intended to remove through the remnant colon by colonoscopy but the procedure failed in one patient (adenocarcinoma) due to a bulky mass and the specimen extraction was converted to transvaginal route. All the patients had prior abdominal surgeries and had related adhesions. The operating times were 210, 300 and 500 min. The lengths of the specimens

were 13, 17 and 27 cm. In our cases, there were no superficial or deep surgical site infections or any other complications. The patients were discharged uneventfully within 4-5 d and they were asymptomatic after a mean 7.6 mo follow-up (ranged 4-12). As far as we know, there were only 12 cases reported yet on transcolonic extraction of the proximal colonic specimens by colonoscopic assistance after laparoscopic resections. With our cases, success rate of the overall experience in the literature was 80% (12/15) in selected cases.

CONCLUSION: Transcolonic specimen extraction for right-sided colonic resection is feasible in selected patients. Both natural orifice surgery and intracorporeal anastomosis avoids mini-laparotomy for specimen extraction or anastomosis.

Key words: Colonoscopy; Colon cancer; Crohn's disease; Laparoscopic surgery; Natural orifice transendoscopic surgery; Natural orifice specimen extraction

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Core tip: Transcolonic extraction of the proximally resected colonic specimens by colonoscopic assistance can be an attractive method for some selected cases. This technique requires both advanced laparoscopic experience by intracorporeal anastomosis and interventional endoscopy. In this technique, there was a far distance between the resected specimen and the natural orifice. The specimen is moved about 100 cm in a hollow organ till the natural orifice. As far as we know, it has been the farthest distance that was reported yet for natural orifice specimen extractions. However, this technique is only suitable for small specimens which can pass through the sigmoid colon.

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INTRODUCTION

Laparoscopic colectomy is going on to increase the number of its supporters. It lets smaller abdominal incisions and this reflects several advantages such as less pain, rapid recovery and wound problems. However, the required mini-laparotomy to extract the specimen during laparoscopic colectomy clearly compromise some advantages of the laparoscopic surgery. The use of natural orifices such as vagina or anus for colonic extraction is a new concept and it can avoid this mini-laparotomy and related morbidities. This new concept is called as Natural Orifice Specimen Extraction (NOSE)

and the first laparoscopic colectomy with transanal specimen extraction has been described at the beginning of 1990's^[1]. Up to the present time, transanal extraction was the main route for the rectal and left sided colonic specimens and transvaginal route was also available for both left and right sided colonic resections^[1]. Transcolonic extraction by colonoscopic assistance can be an attractive method for some selected right-sided colonic resections but, as far as we know, there are only 12 cases reported yet^[2-4]. Here, we reported three more patients with laparoscopic right-sided colonic resections and their specimens were intended to remove transanally by colonoscopy. The aim of this study was (1) to describe our initial clinical experience; (2) to outline our differences from the previous reports; and (3) to review all the available published cases.

MATERIALS AND METHODS

Mechanical bowel preparation was given the night before surgery. Broad-spectrum intravenous antibiotics were administered 30 min before skin incision and postoperatively for three days. Following induction of general anesthesia, a urinary catheter and a nasogastric tube were inserted. The patient were placed in the modified lithotomy position, with legs abducted and slightly flexed at the knees. The abdomen was insufflated by Veress and total of three or four abdominal trocars were used (two 5-12 mm and one or two 5 mm trocars) (Figure 1). The patient was placed in a 15 degree right-up lateral position. We preferred total mesocolic resections for all patients. Medial to lateral mesenteric dissection was carried out and when we identified the distal resection margin, we created a window in the mesocolon at this level and we divided the colon with a 60 mm endoscopic stapling device (EndoGIA, Covidien, Mansfield, MA). The lateral peritoneal attachments of the colon were mobilized from top-to-bottom until the cecum and terminal ileum was transected using the same endoscopic 60-mm linear stapler. A colonoscope was placed per anal and moved proximally in the colon till to reach the colonic closed end under the laparoscopic guidance. Laparoscopically, the stump of the colon was opened with endoscopic scissors and the colonoscope was visualized in the colon (Figure 2). A snare of colonoscope was released and the intraperitoneal complete free colonic specimen was grasped (Figure 3). Specimen was moved in to the colon with the help of the endoscopic graspers and pulled gently through the large bowel by colonoscope. If there was any invagination, it was reduced with graspers. The specimen was pulled through the remnant colon under laparoscopic guidance and extracted through the anus. The open end of colon was closed again with a laparoscopic stapler and the tiny remnant of colonic specimen removed through the 12 mm trocar. The ileal limb and the colon were anastomosed intracorporeally with a 60-mm laparoscopic stapler. The common enterotomy orifice was closed in two layers with a

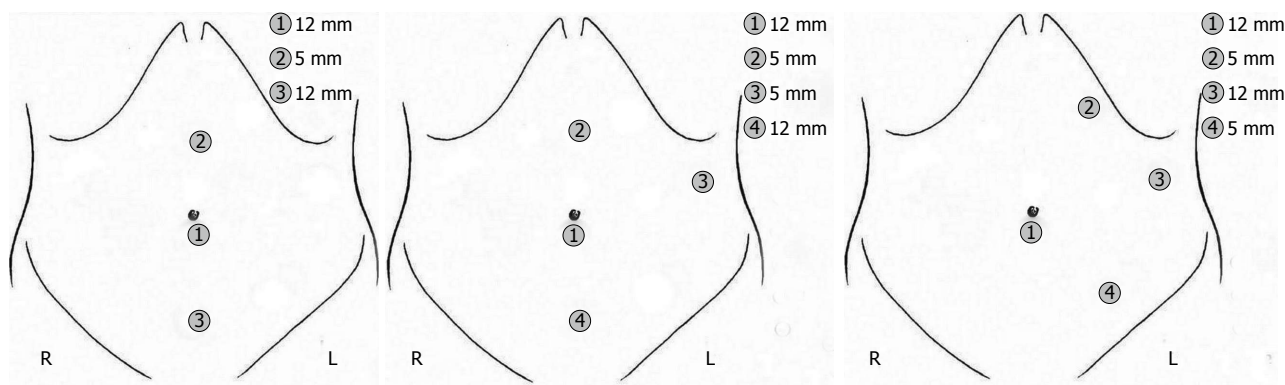


Figure 1 Trocar placements of the patients.

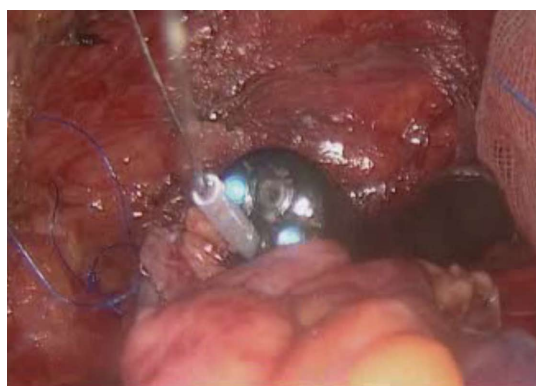


Figure 2 Intraoperative view of the colonoscope passed through the rectum, left colon and transverse colon. It is ready to grasp the laparoscopically resected right colon that was completely free in the abdomen.

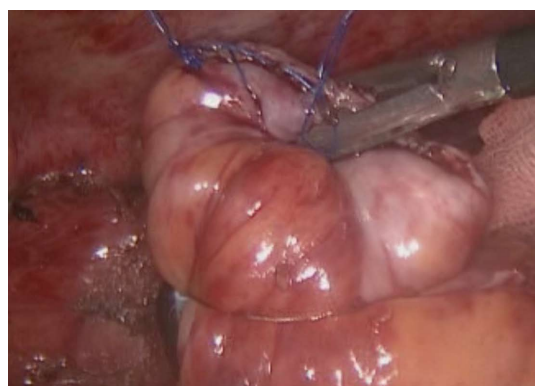


Figure 3 Colonoscopic transcolonic removal of the right colonic specimen.

running intracorporeal suture. An abdominal drain was placed. The nasogastric tube was removed at the end of the operation.

RESULTS

All the details of the patients, diseases and surgical procedures were summarized in Table 1. First patient had a Crohn's disease with intermittent bowel obstruction. He had a previous open appendectomy. Radiologically confirmed ileocolic stenosis was treated by laparoscopic ileocolic resection. There were bulky mesenteric lymph nodes which were very close to the stenotic part of the bowel. Bulky specimen caused some difficulties during transcolonic extraction and the specimen moved in the sigmoid colon in difficulty but the procedure was completed successfully without any complication. The second patient had a history of open appendectomy three months ago. The pathology reported carcinoid tumor with perineural invasion. A laparoscopic right hemi-colectomy with colonoscopy assisted transluminal specimen extraction was performed. There was no problem during transcolonic transit and extraction of the specimen. Pathological examination showed no malignancy. Last patient had a previous history of open pancreaticoduodenectomy due to chronic pancreatitis.

While she was investigated for anemia, a 5-cm ulcerous cecal adenocarcinoma was detected. After laparoscopic right hemi-colectomy the specimen was tried to extract through the transcolonic route but it failed due to the bulky tumor and lymph nodes. In this case, we worried about jamming the specimen in the colon and it was removed from the vagina. The pathological analysis showed a pT3pN2 adenocarcinoma. None of the patients had early or late complication after a mean 7.6 mo (ranged 4-12) follow-up (Table 1).

DISCUSSION

Here, we intended to do a more minimal invasive colorectal surgery than the conventional laparoscopic technique and described three more cases of transcolonic extraction route for right-sided colonic pathologies. The potential advantages of natural orifice surgery are lower risks of incision related complications such as wound infections, postoperative pain, incisional hernias and better cosmesis. None of our cases had wound related early (surgical site infection) or late complication (hernia) in their follow-up. Because all our patients had previous open abdominal surgeries, there were no clear advantage of cosmesis. On the other hand, we learnt that previous abdominal surgery was not an obstacle for transcolonic specimen extraction.

Table 1 Published right hemicolectomies that the specimens were removed through the colon

	Patient No. 1	Patient No. 2	Patient No. 3	Eshuis ¹ (n = 10)	Saad (n = 1)	Takayama (n = 1)
Age (yr)	55	20	68	31 (19-61)	70	71
Gender	M	F	F	3 M, 7 F	F	M
BMI	22	20	27	23.7 (18-31)	NA	NA
ASA	II	I	II	NA	NA	NA
Previous surgery	Yes	Yes	Yes	NA	NA	NA
Operating time (min)	210	300	500	208 (157-327)	NA	240
Blood loss (mL)	20	< 10	400	NA	NA	28
Specimen length (cm)	13	17	27	25.5 (16-64)	NA	8
Specimen width (cm)	8	6	12	> 7 cm (n = 2) < 7 cm (n = 8)	NA	NA
Failure	No	No	Yes	Yes (n = 2)	No	No
Complications	No	No	No	Yes (n = 3)	No	No
Resection location	Ileocolic	RHC	RHC	Ileocolic	Transverse	Ileocolic
Pathology	Crohn's	Carcinoid	Cancer	Crohn's	Adenoma	Adenoma
Oral diet (d)	3	3	2	NA	NA	1
Hospital stay (d)	5	5	4	5 (2-10)	5	4
Follow-up (mo)	12	7	4	NA	NA	NA

¹Numbers of Eshuis are median and range in parenthesis. ASA: American Society of Anaesthesiologists physical status classification; NA: Not available; M: Male; F: Female; BMI: Body mass index.

There are two natural orifices for colorectal specimen extraction: the vagina and the anus. Transvaginal extraction can have some pitfalls. It is limited to female patients, requires an additional surgical trauma to an innocent organ and is not always suitable for patients of childbearing age, teenagers and virgins. Our second case was a virgin and she refused transvaginal access. She specified a preference for transabdominal extraction if the transcolonic extraction failed during surgery. The transanal route is more natural for colorectal specimen extractions and it can be considered as the first option for left sided colorectal resections^[1] or total colectomies^[5]. The transvaginal route can be kept particularly for bulky right sided colonic resections which are not suitable for transcolonic extraction. We preferred the transvaginal route for one case in which the transcolonic extraction failed due to a bulky specimen.

There is no clear description for the limitations of transcolonic specimen extraction. Splenic flexura of the colon (kinking) and the sigmoid colon (narrowing) are the two natural barriers during the transcolonic removal. It is a rational method to select the specimen sizes according to those natural narrow or kinking passes. After extractions, we measured the largest width of the specimens and they were 8, 6 and 12 cm (failed case), respectively. Although the largest width of the specimen is an important parameter, we believe that the largest diameter of the rolled specimen is more important. Eshuis *et al.*^[2] advocated performing transcolonic extraction of specimens with a maximum diameter of 5 cm in patients without inflammatory masses. They aborted two of ten cases due bulky volumes. It is not easy to estimate the largest diameter of every specimen by preoperative evaluation. Moreover, large masses at scans sometimes can be suitable for natural extraction and contrary, the procedure can fail for some small-looking lesions. Therefore we suggest

intraoperative evaluation for decision. We decided to remove two specimens by transcolonic way and both resulted with successes but in one case we converted it to the transvaginal way. The overall success rate of the transcolonic removal of the proximal colon in all published cases was 12/15 (80%).

Transcolonic extraction of ileocolic resection has been first described for Crohn's disease^[2]. Contrary to us, authors divided the mesentery close to the bowel for easier extraction. We believe that some modifications such as intracorporeal mesenteric division can reduce the largest diameter of the specimen and let the transcolonic extraction^[6]. As a major morbidity, two postoperative intraabdominal abscesses were reported in the same study^[2]. We believe that the main reason of high abdominal infection rate was related with the obstructed terminal ileum. In this study, the authors let the terminal ileum remained open freely to the abdomen for a long operating time. The authors created a side to side ileocolic anastomosis first and later they took out the specimen through this anastomosis. Till the end of the extraction, the distended small bowel went on to contaminate the abdomen. As a difference, we took the specimen into the colon before the anastomosis and the terminal ileum stayed as closed during the extraction time. The terminal ileum was opened just before the anastomosis and the common orifice of the linear stapler was closed immediately. We observed no deep or superficial surgical site infections.

For the first time, we reported that a right-hemicolectomy material was removed through the remnant colon. As mentioned before, Eshuis *et al.*^[2] preferred only ileocolic specimens, similarly Takayama *et al.*^[4] reported a case of ileocolic resection for a polyp. Lastly Saad *et al.*^[3] described a transverse colon resection for a polyp and extracted it through the transcolonic route. Those reported cases with ours all demonstrated that

transcolonic specimen extraction for ileocolic resection, transverse colon resection or even right hemi-colectomy is feasible in selected patients.

As a natural orifice surgery, transcolonic specimen extractions for some right-sided colonic resections and combination with intracorporeal anastomosis let to avoid mini-laparotomy during laparoscopic surgery.

COMMENTS

Background

At laparoscopic colorectal surgery, the use of natural orifices for colonic specimen extraction is a new concept. It can avoid mini-laparotomy and related morbidities.

Research frontiers

Transcolonic extraction of the proximally resected colonic specimens by colonoscopic assistance can be an attractive method for some selected cases. As far as we know, there are only 12 cases reported yet and here, the authors reported three more patients with laparoscopic right-sided colonic resections. All the specimens were intended to remove through the remnant colon by colonoscopy.

Innovations and breakthroughs

Transcolonic specimen extraction for ileocolic resection or even right hemicolectomy is feasible in selected patients.

Applications

Combination with natural orifice surgery and intracorporeal anastomosis avoids mini-laparotomy for specimen extraction or anastomosis.

Terminology

NOTES: Natural orifice transluminal endoscopic surgery. NOSE: Natural orifice specimen extraction.

Peer-review

The authors have performed a good study, the manuscript is interesting.

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