Evaluation of transanal total mesorectal excision in treatment of low rectal cancer

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Introduction
Colorectal cancer is the third most prevalent cancer in the world and the fourth leading cause of cancer-related death. Treatment results are directly related to the quality of surgery. Complete total mesorectal excision is challenging, especially in obese male patients with narrow or deep pelvis. The transanal approach helps to overcome exposure limitation and instrumentation in low pelvic surgery, yielding a better treatment outcome.

Objectives
To assess the transanal approach for total mesorectal excision in the treatment of rectal cancer regarding operative time, intraoperative events, and oncological safety.

Patients and methods
A total of 17 patients with mid to low rectal cancer, attending the colorectal unit of General Surgery Department of Ain Shams University Hospital, were included in the study. All patients underwent laparoscopic anterior resection with transanal total mesorectal excision.

Results
A total of 12 male and five female patients were included in this study. The mean operative time was 311.82±44.98 min. Transanal total mesorectal excision was completed in 14 patients. Laparoscopic conversion was required in three patients. Postoperative histopathological assessment of the resected specimens showed that adequate oncological resection was accomplished in all of our patients.

Conclusion
Transanal total mesorectal excision is a feasible and reproducible technique for the surgical management of low rectal cancer. It is safe after gaining appropriate experience. It carries an extra advantage for male patients with narrow or deep pelvis and those with tough edematous pelvic planes after chemoradiation.

Keywords:
low anterior resection, rectal cancer, transanal total mesorectal excision

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Introduction

Colorectal cancer is the third most prevalent cancer in the world and the fourth leading cause of cancer-related death. It is more commonly diagnosed in developed countries [1].

The exact etiology of colorectal cancer is unknown; however, it is thought to be related to certain risk factors, including old age, family history, smoking, and excessive dietary fat [2].

Rectal cancer surgery has witnessed a huge progression over the past century. Abdominoperineal resection was described by Ernest Miles in 1908. He proved that rectal cancer must be removed from both abdomen and perineum, reducing the local recurrence rate from 100 to 30%. With the progression of surgical tools and techniques, sphincter-saving procedures became possible. Anterior resection replaced abdominoperineal resection as the standard curative resection but with poor oncologic results regarding local recurrence and overall survival. Emile *et al.* [3] published the idea of total mesorectal excision, which entails sharp circumferential dissection of the mesorectum from the surrounding structures in an avascular interface, 'holy plane,' so that the rectum and mesorectum are resected as a closed envelop. A successful total mesorectal excision is a positive prognostic factor against local recurrence.

Complete total mesorectal excision is challenging even for highly experienced surgeons especially in difficult situations, such as obese male patients, narrow or deep pelvis, prostatic hyperplasia, distortion of dissection

planes after chemoradiotherapy, and locally advanced tumors. Transanal total mesorectal excision is a new surgical approach designed to facilitate proper exposure and instrumentation in rectal cancer surgery by approaching the rectum from below [4].

Transanal total mesorectal excision is a safe alternative to traditional laparoscopic surgery only if proper experience has been gained and suitable equipment is available. The spread of this innovative surgical option will increase if long-term functional and oncological results are adequate [5].

Patients and methods

This was a prospective analytical study. Data were collected from patients who underwent laparoscopic anterior resection with transanal total mesorectal excision for rectal cancer in the period between October 2018 and December 2020 in the colorectal unit of Ain Shams University Hospitals by the same surgical team. Approval of the ethical committee and written informed consent from all participants were obtained.

Patient selection was achieved through the following inclusion and exclusion criteria:

Inclusion criteria:

(1) Patients who were fit for laparoscopic anterior resection.
(2) Patients with early-mid to low rectal cancer as defined by patients with tumors T1, T2, or T3 after neoadjuvant chemoradiation (tumor limited to the rectal wall not reaching serosa by MRI at the time of surgery).

Exclusion criteria:

(1) Patients with recurrent low rectal cancer.
(2) Patients who are unfit for laparoscopic anterior resection.
(3) Patients with inflammatory bowel disease.
(4) Emergency presentations.

Surgical approach

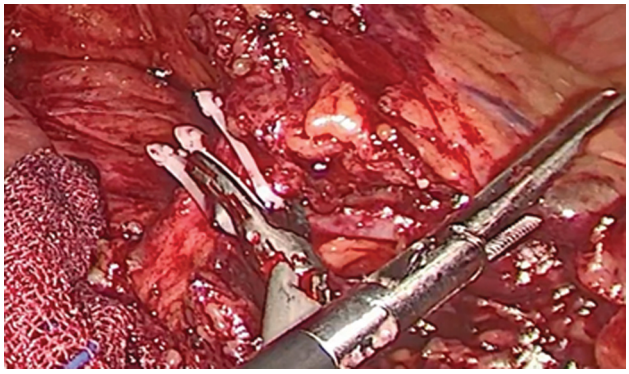
Equipment: equipment required for an open and laparoscopic low anterior resection was prepared. Specialized equipment for transanal mesorectal excision which we used included GelPoint Path Transanal Access Platform (Applied Medical Inc., Rancho Santa Margarita, California, USA).

Preparation: all patients had full mechanical bowel preparation. Standard preoperative antibiotics, urinary catheter, and antithrombotic prophylaxis with enoxaparin were given. The planned ileostomy site was marked preoperatively. Patients were placed in a modified lithotomy position. Preparation of the abdomen and perineum included washing out of the vagina and rectum with betadine was done.

Technique: transabdominal part is initiated first. A primary optical port is inserted subumbilically, and the abdomen is insufflated. Diagnostic laparoscopy is done first to assess the presence of any hidden metastasis. Three 5-mm ports are inserted in the right lower quadrant, right upper quadrant, and left lower quadrant. The small bowel is mobilized to the patient's right side. Splenic flexure mobilization is done routinely to allow tension-free anastomosis. Medial to lateral dissection is performed. The left ureter is identified. The inferior mesenteric artery is highly ligated and divided. The inferior mesenteric vein is identified and divided. Descending colon and recto-sigmoid junctions are mobilized from their lateral attachments (Fig. 1).

The transanal part was initiated once peritoneal reflection was incised from the abdomen. Transanal platform was applied. A conventional insufflation system was used. A 2/0 prolene purse-string suture was placed distal to the tumor with an adequate safety margin (at least 1 cm). Full-thickness rectal wall incision was performed circumferentially. Dissection was begun posteriorly in the plane between mesorectum and presacral fascia. Lateral dissection was done close to the mesorectal fascia to avoid neurovascular bundle injury. Anterior dissection was done in the rectovaginal plane or posterior to Denonvilliers' fascia in males with special attention to avoid vaginal or urethral injury. Dissection was

Figure 1



High ligation of inferior mesenteric artery.

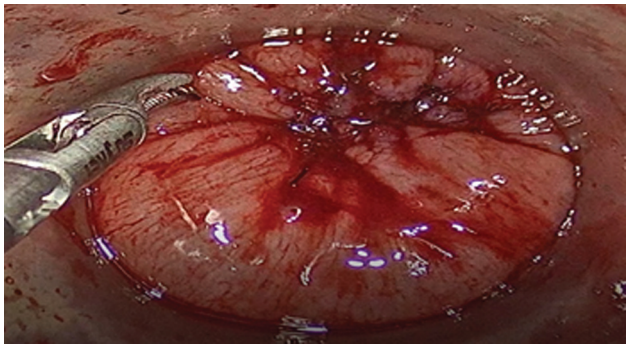
continued circumferentially until the peritoneal reflection was reached (Fig. 2).

Once total mesorectal excision was completed, the specimen was extracted transanally. A stapled end-to-end anastomosis or a hand-sewn coloanal anastomosis in case of low rectal tumors was performed. A covering loop ileostomy was done routinely (Fig. 3).

The quality of the excised mesorectum was checked, and the specimen was sent for histopathological assessment (Fig. 4).

The surgical technique was assessed regarding operative time, intraoperative events, extent and quality of excised mesorectum, and failure rate of transanal excision. Postoperative follow-up included the duration of hospital stay as well as pathology of the resected specimen to ensure radical resection for oncological safety. Adequacy of resection and oncological outcome was assessed in terms of proximal margin, distal margin, circumferential resection margin, and gross quality of the resected specimen (intact mesorectum with good quality).

Figure 2



Purse-string suture distal to tumor margin.

Figure 3

Hand-sewn coloanal anastomosis.

Statistical analysis

Analysis of data was done using IBM SPSS software (Statistical Package for Social Science; version 21) (IBM, Armonk, New York). The data were collected tabulated and statistically analyzed. Description of the quantitative variable was done as mean, SD, and range, whereas qualitative data were presented as numbers and percentages. The confidence interval was set to 95%, and the margin of error accepted was set to 5%.

Results

Patients' demographic characteristics are demonstrated in Tables 1 and 2 shows the assessment of intraoperative events. Postoperative evaluation is demonstrated in Table 3.

Figure 4

Assessment of excised mesorectum.

Table 1 Patient characteristics

Age (years)	
Mean±SD	49.88±6.06
Range	38–58
Sex [*n* (%)]	
Male	12 (70.6)
Female	5 (29.4)
BMI (kg/m^2)	
Mean±SD	29.41±3.47
Range	23–37
American Society of Anesthesiologists (ASA) score distribution [*n* (%)]	
ASA I	11 (64.7)
ASA II	5 (29.4)
ASA III	1 (5.9)
Tumor location from anal verge	
Mean±SD	6.53±0.72
Range	6–8

Table 2 Operative evaluation

Operative time (min)	
Mean±SD	311.82±44.98
Range	245–398
Intraoperative blood loss (ml)	
Mean±SD	117.64±55.73
Range	50–200
Incidence of intraoperative complications [*n* (%)]	
Negative	15 (88.2)
Positive	2 (11.8)
Type of anastomosis [*n* (%)]	
Stapled end-to-end colorectal anastomosis	13 (76.5)
Hand-sewn coloanal anastomosis	4 (23.5)
Rate of conversion from transanal to laparoscopic total mesorectal excision [*n* (%)]	
No	14 (82.4)
Yes	3 (17.6)

Table 3 Postoperative evaluation

Postoperative hospital stay (days)	
Mean±SD	7±3.48
Range	5–17
Incidence of postoperative complications [*n* (%)]	
Negative	13 (76.5)
Positive	4 (23.5)
Rate of hospital readmission [*n* (%)]	
Negative	14 (82.4)
Positive	3 (17.6)
Evaluation of oncological outcome [*n* (%)]	
Adequate	17 (100)

Discussion

Treatment of rectal cancer has witnessed huge progress over the past century. The basic principle for a successful cancer rectum surgery is the radical resection of both the primary mass and the associated lymph nodes. This was proved by Miles. The idea of the holy plane during total mesorectal excision was later described by Heald, which entails, which entails sharp dissection of the mesorectum along an avascular tissue plane, thus removing both rectum and mesorectum as an intact envelope.

Total mesorectal excision can be achieved either by open, laparoscopic, or transanal approach. It is challenging even for experienced surgeons, especially in obese male patients, those with the narrow or deep pelvis, and those with prostatic hyperplasia [7].

Transanal total mesorectal excision was first described by Sylla *et al.* [8]. It aims to overcome the technical difficulties for adequate mesorectal excision. It is done in an opposite direction to the conventional method, that is, from below upward. This provides excellent exposure of the surgical field, particularly in difficult situations. It helps to improve the quality of the resected specimen; thus, surgical quality is better at improving treatment outcomes [9].

Transanal total mesorectal excision is a demanding procedure. It requires two separate setups and laparoscopic towers with special insufflators. It may require two surgical teams if a simultaneous approach is needed to reduce operation time. It mandates a longer learning curve. These technical difficulties in addition to the risk of occurrence of rare complications compared with conventional methods limit the spread of this new technique [6].

In the current study, we described our initial experience with the transanal total mesorectal excision technique for selected patients with low and mid-rectal cancer. We performed transanal total mesorectal excision on 17 patients with rectal cancer. The technique was evaluated in terms of intraoperative factors, postoperative events, and outcomes.

The mean age of patients was 49.88 years. They were predominantly males [12 (70.6%) males and five (29.4%) females]. The mean BMI of patients was 29.41 kg/m^2. The majority of our patients had American Society of Anesthesiologists (ASA) score I (64.7%), 29.4% of our patients had ASA score II, and only 5.9% of our patients had ASA score III. We mainly reserved transanal total mesorectal excision for patients who were generally fit for surgery with good performance status. Our patients' demographic characteristics were similar to those obtained by Mikalauskas *et al.* [9], who published a case series of 25 patients in 2019. The patients were predominantly males (72%), with a mean BMI of 29 kg/m^2.

Regarding tumor distance from the anal verge, the mean tumor location was 6.53 cm from the anal verge. This is a long distance from the anal verge compared with the study published by Simo *et al.* [10], where the mean tumor distance was 4.9 cm. In the study published by Mikalauskas *et al.* [9], the mean tumor location was 7.8 cm. Rubinkiewicz *et al.* [7] published a study that included 35 patients, and the mean tumor location was 2.9 cm. We selected patients with a longer tumor distance from the anal verge to facilitate the procedure and overcome the intraoperative difficulties while progressing on our learning curve.

The mean operative time was 311.82 min. The mean intraoperative blood loss was 117.64 ml. The mean

operative time was longer and the amount of blood loss was less compared with the study done by Rubinkiewicz *et al.* [7], who published a case-matched study comparing transanal total mesorectal excision with standard laparoscopic TME. In this study, the mean operative time was 271 min, whereas the mean blood loss was 165 ml. The longer operative time in our study could be attributed to technical difficulties as we are still building experience for this novel technique. Our operative time improved with practice as we became more familiar with the technique and the anatomy. Our best time was achieved in the last cases. None of our patients experienced significant intraoperative morbidity or required intraoperative blood transfusion.

The majority of our patients (88.2%) had a smooth intraoperative course. Only two of our cases experienced an intraoperative complication. The first one was a vaginal tear, which was repaired transanally. The second was bleeding from the inferior mesenteric artery stump. Immediate hemostatic control was done laparoscopically using hemoclips.

Stapled end-to-end anastomosis was performed in most of our patients (76.5%). Hand-sewn coloanal anastomosis was done only in four of our patients when stapled anastomosis was not possible and in low rectal tumors requiring resection of the internal sphincter to achieve a negative resection margin. This is similar to the results published by Rubinkiewicz *et al.* [7] who reserved coloanal anastomosis for selected cases when stapler anastomosis was not feasible.

Transanal total mesorectal excision was completed in 82.4% of our patients. Conversion from transanal to laparoscopic total mesorectal excision was performed only in three patients. This could be attributed to technical difficulties including poor insufflation with extra fogging and unclear anatomy during dissection. One of our patients experienced an intraoperative vaginal tear which was repaired transanally. The laparoscopic conversion was done to facilitate proper anterior dissection. This is comparable to the results published by Bjorn and Perdawood [11], who reported completion of transanal total mesorectal excision was accomplished in 88% of their patients.

The mean length of hospital stay was 7 days. The duration of hospital stay was directly related to the incidence of postoperative complications. The longest period was 17 days. This is a shorter duration compared with the study published by Mikalauskas *et al.* [9], in which the mean length of hospital stay was 11 days.

Most of our patients (76.5%) experienced a smooth postoperative course. Two patients had severe urine retention, which was managed by applying a urinary catheter for a longer duration, which was later removed after adequate training. Another two patients with stapled end-to-end anastomosis experienced anastomotic dehiscence with subsequent pelvic sepsis. One of them was diagnosed on the fifth postoperative day and the other was readmitted 6 days after hospital discharge. Both presented with fever, pelvic pain, and purulent anal discharge. Examination under anesthesia, transanal drainage was done, followed by administration of antibiotics according to culture and sensitivity. A covering loop ileostomy was done routinely in our patients; this helped to reduce the risk of sepsis as a result of anastomotic leakage. In addition, it contributed to the improvement of oral intake despite anastomotic dehiscence with subsequent enhanced recovery. This is comparable to the study published by Rubinkiewicz *et al.* [7] in which the rate of postoperative complications was 17%. Postoperative complications included anastomotic leakage with concomitant sepsis, postoperative ileus, and radial nerve paresis due to prolonged compression on the operating table. In the study published by Simo *et al.* [10], the most common postoperative complication was ileus followed by anastomotic fistula and pelvic abscess. In the study published by Mikalauskas *et al.* [9], the overall postoperative morbidity was 8%. The most serious complication was peritonitis on top of missed small bowel injury, which required laparotomy and suturing of the defect.Hospital readmission was required for three (17.6%) patients. Overall, two patients were readmitted 2 weeks after hospital discharge with electrolyte disturbance, which was corrected by intravenous fluids administration. The third one was readmitted for anastomotic dehiscence and pelvic sepsis 6 days after hospital discharge. While examination under anesthesia, transanal drainage was done, followed by proper antibiotics. Eventually, all patients successfully recovered and were discharged from the hospital.

Regarding oncological outcomes, histopathological assessments of all resected specimens revealed that oncological resection was accomplished in all patients. Proximal, distal, and circumferential resection margins were adequate and free of invasion. This is similar to the study published by Simo *et al.* [10], who achieved oncological resection in 98% of their patients.

From our point view, transanal total mesorectal excision is safe and feasible only if proper experience has been gained and suitable equipment is available. It

improves visualization of the surgical field, especially in difficult situations. The quality of the resected specimen seems to be excellent, and short-term oncologic results are promising. However, it is a demanding procedure from both financial and technical aspects requiring a longer learning curve compared with traditional laparoscopic mesorectal excision. Further studies on a bigger sample size are needed to evaluate long-term oncological and functional outcomes to overcome the rising fear of adopting this novel technique.

Conclusion

Transanal total mesorectal excision is a feasible and reproducible technique for the surgical management of low rectal cancer. It has the advantage of being safe after gaining appropriate experience. It provides patients with an alternative oncologically safe surgical option for sphincter-saving procedures for low rectal cancer. It carries an extra advantage for male patients with narrow or deep pelvis and those with tough edematous pelvic planes after chemoradiation.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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