Transanal Total Mesorectal Excision for Treatment of Carcinoma in the Middle or Lower Third Rectum: the Technical Feasibility of the Procedure, Pathological Results, and Clinical Outcome

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Abstract

We are trying to illustrate operative, short-term, and pathological outcomes of transanal total mesorectal excision (TaTME) as a surgical procedure for patients who are suffering cancer in the lower or middle rectum. This study included 25 consecutive patients who underwent TaTME for the mid and low cancer rectum. The primary outcome measures included frequency of postoperative (PO) bleeding, leakage, ileus, days to regain bowel function, days for Foley's removal, and erectile function. The secondary outcome measures included operation time, status of resection margins, number, the quality of TME, and duration PO hospital stay. No recorded intraoperative complications. The mean hospital stay was 6.9 ± 2.6 days. The mean duration need for urinary catheter removal and flatus passage were 2.4 ± 2.1 and 1.5 ± 0.9 days, respectively. The mean IPSS was returned to normal 12 months after surgery. The mean distal margin distance was 1.9 ± 1.1 . Circumferential margin distance was > 1 mm in 23 (92%) patients. The mesorectum was complete in 22 (88%) patients. The survival rate was 88% over 3 years. TaTME could be considered as a safe, feasible, and effective surgical modality for patients who had mid and lower rectal tumors with an excellent pathological outcome.

Keywords CA rectum · Transanal · TME · Pathological outcome

Introduction

The rectum is defined as the part of the bowel that extends from the anorectal ring up to 15 cm proximal. The lowest 6 cm represents the lower rectum, the mid rectum located between 6 and 12 cm, and the upper rectum from 12 to 15 cm [1]. Rectal cancer considered as one of the commonest carcinomas, all over the world [2]. Heald defined total mesorectal excision

(TME) as the best operation for resection of cancer rectum [3, 4]. The TME has been defined as a complete removal of the rectum and rectal cancer together with the surrounding lymphovascular fatty tissue (mesorectum) as a “tumor package” using a sharp dissection under direct vision along the embryonic avascular plane “holy plane” at the visceral pelvic fascia to reduce the burden of residual tumor [4]. Throughout the recent decades, TME done via an open

Synopsis In this study, we are trying to illustrate the operative, clinical, and pathological outcomes of TaTME as a surgical procedure for patients who are suffering cancer in the lower or middle rectum. We included 25 patients in our study over 3 years. Operations done laparoscopically, specimens examined histologically then patient followed postoperatively.

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surgery, however, with the advancement of minimally invasive surgery, everything changed, and TME has shifted to a laparoscopic from an open approach [5].

For rectal cancers, laparoscopic surgery has been established to be safe and effective in the deep pelvis to enable mobilization of the rectum, with a decrease in the postoperative (PO) pain and short recovery as well as a short hospital stay [6]. However, LapTME may be accompanied by high rates of circumferential resection margin (CRM) involvement as well as sexual dysfunction in male compared with open TME [7]. Additionally, male gender, narrow pelvis, and high body mass index (BMI) are unfavorable patients' features for a laparoscopic method [8]. According to the above-mentioned concerns, the idea of a "down-to-up" transanal TME technique (TaTME) has been suggested to give a new choice to improve the dissection in the distal part of TME in conditions where LapTME is difficult.

There is no doubt that an accurate pathological report of the specimens in rectal cancer has important effects on the clinical management and the individual patient prognosis [9]. The totality of tumor resection depends on the evaluation of resection margins (distal, proximal, and CRM) [10]. The superiority in the perioperative and pathological results of TaTME in comparison with those of LapTME remains a point of controversy [11]. Therefore, this study was conducted to investigate the clinical and pathological outcomes of TaTME for surgical management of patients with middle and lower rectal cancer to provide direct evidence before unifying TaTME procedures.

Patients and Method

The present study was done at the General Surgery Department, Banha University Hospital, in Egypt and King Saud Hospital in Saudi Arabia from January 2015 to February 2018. The study includes 25 consecutive patients who underwent TaTME for surgical management of a biopsy-proven mid or low rectal cancer. After approval of the study protocol by the Ethical Committee and obtaining fully informed written patients' consent for the participation in the study. Patients were fully informed about the hazards and benefits of the TaTME. The Patients assessed by a multidisciplinary team (includes one or more specialized representative from general surgery, pathology, radiology, radiotherapy, and medical oncology) and patients enrolled in the study if they fulfilled our inclusion criteria. Each hospital utilized its own surgical team; however, the guidelines of TaTME were followed in both hospitals.

Patients were evaluated clinically through general and local abdominal examinations, including digital rectal examination (DRE). Routine laboratory tests as well as level of carcinoembryonic antigen (CEA) were assessed. Diagnostic imaging was done to evaluate the locoregional extent of the

tumor by means of pelvi-abdominal computed tomography (CT) scan, pelvic magnetic resonance imaging (MRI), and/or endorectal ultrasound (ERUS). Distant metastasis excluded by CT of the pelvis, abdomen, and chest. A complete colonoscopy was done preoperatively in all patients to exclude synchronous lesions, and a biopsy was taken for histopathology confirmation. The preoperative gross criteria of the tumor, the distance of the tumor distal margin of the anorectal ring, ulceration, size, position, and fixity were determined by clinical exam and flexible sigmoidoscopy. Tumor staging was done with pelvi-abdominal and chest CT as well as pelvic MRI and/or ERUS.

Inclusion criteria included (i) a biopsy-proven rectal cancer in the mid/lower third which assessed by MRI as a low risk cancer (T1–T3 a–b < 5 mm N0/N1) [12, 13], (ii) age $\geq$ 18 years and $\leq$ 70 years, and (iii) score of I–III according to the American Society of Anesthesiology (ASA). Exclusion criteria were (a) any contraindications for laparoscopic surgery, (b) rectal cancer located $\geq$ 12 cm from the anal verge, (c) tumors assessed by MRI as a locally advanced (T3 > 5 mm, T4, N2 lesions, or extramural venous invasion), (d) synchronous colonic lesions confirmed by a biopsy, (e) former rectal tumor transanal excision, (f) participation in an additional device or drug study, (g) notable psychiatric disease, and (h) ASA score $\geq$ IV.

The collected data were (1) demographic data comprising age, gender, BMI, ASA score, and associated coexisting diseases, (2) tumor characteristics included site, either the middle or lower rectum; tumor stage, I, II, or III; and tumor differentiation, well, moderate, or poor, (3) operative and PO data, including operative time, the length of hospital stay, PO complications, and pre- and PO sexual and urinary assessment, (4) pathological data, including the pathological stage, the total number of the removed lymph nodes (LNs), and the condition of longitudinal as well as circumferential margins, (5) the International Index of Erectile Function (IIEF), as well as the International Prostate Symptoms Score (IPSS), voluntary questionnaires which used to evaluate the sexual and urinary dysfunction, respectively. The questionnaires implemented preoperatively and 1 and 12 months subsequent to surgery, and (6) recorded PO data included time to remove the urinary catheter, time to passing flatus or stool, length of hospital stay days, and PO morbidities. Pathological outcome data involved the completeness of the mesorectum based on the Quirke criteria in 2007 [14], CRM, and distant margins. Malignant cells within 1 mm or less of the resection margin were considered as positive CRM. Data were collected at each participating hospital and then analyzed.

Patients' Preparation

The day before surgery, a mechanical bowel preparation was done for all patients either orally or with enemas to facilitate

rectal anastomosis. The day of surgery, all patients received antibiotic prophylaxis (cefazoline 2 g IV and metronidazole 500 mg infusion) 1 hour before surgery.

Surgical Technique

All operations completed through a combined abdominal and perineal approaches. Operations were performed under general anesthesia, proper fixation of the patient on the OR table. The abdominal portion was first accomplished through a laparoscopic approach. After skin preparation, draping, and towel-eling, a 4-port technique used a periumbilical 12-mm port for the endoscope and 10/12 and 5-mm ports inserted in the right iliac fossa and right hypochondrium, respectively. The 4th 5-mm port inserted in the left flank for the help during pelvic dissection. Insufflation of the abdomen with CO₂ up to a pressure of 15 mmHg.

Exploration of the abdomen that includes direct visualization of the viscera, liver, and peritoneum, as well as an accurate locoregional assessment of the tumor. A complete mobilization of the splenic flexure, left colon, and sigmoid colon. Higher division of the inferior mesenteric artery (IMA) at its origin as well as division of the inferior mesenteric vein (IMA) at the inferior margin of the pancreas. The hypogastric nerves (HNs) and the left ureter were identified and well-preserved at the base of the sigmoid mesentery overlying the bifurcation of the common iliac artery. The dissection proceeds caudally anterior to the autonomic nerves. The abdominal part of TME has three main aspects of dissection (posterior, anterior, and lateral). The technique consists of a combination of these steps, but we standardized the approach through beginning with the posterior dissection to continue laterally on the right side then on the left side and dissection finished anteriorly. The presacral nerves, inferior hypogastric plexuses (IHP), and HNs were identified and well-preserved, except in case they fixed to the tumor. Transabdominal dissection has been taken down to the level of seminal vesicle in males or vaginal vault in women anteriorly as well as up to Waldeyer's fascia and S4–5 posteriorly (Fig. 1, green arrows), then the dissection completed transanally (Fig. 1, blue arrows).

Once the abdominal portion has been completed, the patient placed in the lithotomy position. Anal dilatation, anal retraction, and access channel insertion clearly identify the tumor; the rectal lumen closed with a purse-stringed suture distal to the tumor margin, the rectal wall is then divided (full thickness incision) just distal to the purse string. This allows for complete division of the rectum distal to the lesion, with a visible negative distal margin. A Transanal Access Platform (Applied Medical, Inc. Rancho Santa Margarita, CA, USA) inserted and fixed to the access channel, CO₂ insufflated to a pressure of 8–10 mmHg. The transanal upward dissection of the mesorectum started posteriorly (Fig. 2) between the mesorectum and the presacral fascia, then anteriorly (Fig. 3)

Fig. 1 MRI rectum, demonstrating the direction and parts of TaTME. Transabdominal dissection (green arrows). Then the dissection completed transanally in a “bottom-up” direction (blue arrows)

between the Denonvilliers' fascia and prostatic capsule or vaginal wall. The dissection continued from the posterior and anterior plane laterally (Fig. 4) and upward to meet with the abdominal portion. The anterior dissection meets the abdominal part of TME at the level of the seminal vesicles. The rectal specimen was removed transanally. For lower lesions, the operations completed with a hand-sewn transanal coloanal anastomosis. On the other hand, for higher tumors, the long distal stump allows for an end-to-end colorectal anastomosis using a circular GIA stapler (Covidien, Mansfield, MA, USA). The anastomosis assessed by an air leak test after filling the pelvis with saline. In the majority of patients, a transient diverting proximal loop enterostomy was done unless a permanent stoma is being fashioned. A presacral suction drain inserted thoroughly.

Fig. 2 Posterior dissection between the parietal endopelvic fascia of presacral fascia and the mesorectal envelope

Fig. 3 Anterior dissection between the anterior layer of Denonvilliers' fascia and prostatic capsule

Pathological Grading of the TME Specimen

The TME specimen received at the laboratory unopened and intact to allow for appropriate handling and evaluation by the pathologist. The specimen oriented with the cranial end toward the left and the caudal end to the right. The specimen surface was inked, the mesorectal dimension was measured (length by width by thickness), and grossly graded according to a TME mesorectum grading system of the College of American Pathologists (CAP) as follows: (1) complete TME, an intact mesorectum + minor irregularity < 5 mm, no coning in the direction of the distal margin, and smooth CRM on transverse sectioning of the mesorectum, (2) nearly complete TME, 1 or more defects into the mesorectum > 5 mm, moderate coning with no exposed muscularis propria, and uneven CRM on transverse sections, and (3) incomplete TME, the muscularis propria exposed, moderate to marked coning, and uneven CRM on transverse sections.

Fig. 4 Lateral dissection between the mesorectum and lateral pelvic wall

Fig. 5 Section of the rectal specimen after TME stained with hematoxylin and eosin shows malignant cells infiltrate the muscularis propria (black arrow) with free CRM (blue arrow) (H&E, × 10)

The bowel was opened from the antitumor side to assess tumor dimensions, extension as well as the distance between the tumor edges and both proximal and distal resection margins. We started the dissection of the mesorectum at a distance of 5 mm for a sampling of any harvested lymph nodes or metastatic tumor nodule. Then, the rectal mass was cross-sectioned from outside towards the lumen at 3 to 5 mm distance. A representative section was taken every other section. After processing, embedding, slicing the blocks by microtome, and staining of the slides by routine H&E stain, we examined the slides under the microscope to determine the margin status (Fig. 5) and to detect any possible mode of tumor spread, which could be continuous or discontinuous malignant growth infiltration of the perirectal fat (Fig. 6), vascular or neural invasion, and lymph node metastasis. The CRM considered positive when the malignant cells detected

Fig. 6 Section of the rectal specimen after TME stained with hematoxylin and eosin shows malignant cells infiltrate the mesorectum (yellow arrow) (H&E, × 10)

on a distance < 1 mm from the CRM. Pools of mucin not containing malignant cells at the level of the CRM after neo-adjuvant radiochemotherapy are considered as negative (according to CAP).

Postoperative Care

Postoperatively, patients were managed by current enhanced recovery after surgery protocols (ERAP) as outlined in our previous publication. Patients discharged home after complete recovery on POD 4–6. The loop ileostomy closed on the 6 to 8 PO weeks after confirmation of anastomosis integrity by using a water-soluble contrast study. Patients' follow-up in the outpatient clinic 2 weeks after discharge and sustained every 3 months for the 1st 2 years, then every 6 months for the following 2 years.

Follow-up assessments involved (1) clinical examination with the digital rectal exam, (2) flexible sigmoidoscopy was done every 6 months for the 1st 2 years, (3) full colonoscopy was done 1 year after surgery, then every 3 years thereafter, (4) measurement of CEA levels at each visit, (5) CT of the abdomen, pelvis, and chest was done at 6 months, 1 year, and then

annually, and (6) PET–CT was done when recurrence was suspected.

Statistical Analysis

Data presented as mean $\pm$ SD, ranges, numbers, and ratios. Results analyzed using Wilcoxon's ranked test for unrelated data (Z-test) and chi-square test (χ^2 test) for numerical data. Statistical analysis was done using the SPSS (version 21 for Windows; SPSS Inc., Chicago, IL, USA) statistical package.

Results

The study included 25 patients; 20/25 males and 5/25 females with mean age 53.6 ± 7.5 , range 25–68 years. Tumors were located in the middle third of the rectum in 14 patients and in the lower rectum in 11 patients. In 21 cases, rectal tumors were ulcerating and non-ulcerating in four cases (Table 1). The mean operative time was 143 ± 17.9 , range 130–190 min. One case required conversion to an open surgical approach. Proximal protective entrostomy was done in 22 patients. The bowel

Table 1 Patients' demographic and preoperative clinicopathological data

Data	Strata	Findings
Age (years)		53.6 ± 7.5 (25–68)
Gender, <i>n</i> (%)	Males	20 (80%)
	Females	5 (20%)
ASA score, <i>n</i> (%)	I/II	19 (76%)
	III	6 (24%)
CEA level (initial)		3.9 ± 11.2 (0.6–99.8)
Tumor location, <i>n</i> (%)	Middle (≥ 7 cm and < 12 cm)	14 (56%)
	Lower (< 7 cm)	11 (44%)
Tumor position, <i>n</i> (%)	Anterior	6 (24%)
	Posterior	10 (40%)
	Lateral	9 (36%)
Tumor ulceration, <i>n</i> (%)	None	4 (16%)
	Ulcerating	21 (84%)
Tumor fixity, <i>n</i> (%)	Mobile	19 (76%)
	Fixed	6 (24%)
Tumor clinical stage, <i>n</i> (%)	I	1 (4%)
	II	10 (40%)
	III	14 (56%)
Coexisting disease*	Diabetes mellitus	6 (24%)
	Ischemic heart disease	2 (8%)
	Hypertension	6 (24%)
	COPD	2 (8%)
	Renal impairment	2 (8%)

Data are presented as mean $\pm$ SD and numbers; ranges and percentages are in parenthesis. *BMI* body mass index, *ASA* American Society of Anesthesiologists, *COPD* chronic obstructive pulmonary disease. *some cases had more than one coexisting disease

continuity regained through a colorectal anastomosis using a circular GIA stapler in 22 patients as well as coloanal hand-sewn anastomoses in three cases as summarized in Table 2.

The mean duration of hospital stay was 6.9 ± 2.6 , range 5–10 days. The mean PO time needed to remove the Foley catheter was 1.9 ± 2.1 , range 2–5 days. However, a urinary catheter reinserted for one patient due to post-removal retention of urine. The mean duration of PO passage of flatus was 1.5 ± 0.9 , range 2–3 days; however, the mean duration of stool passage was 2.7 ± 1.5 , range 2–5 days. Throughout the mean duration of follow-up of 28.6 ± 5.9 , range 7–36 months, we recorded three cases of recurrence (two systemic and one local and systemic), with a disease-free rate 88% (Table 3). The mean IPSS was elevated 1 month after surgery; however, it returned to normal 12 months after surgery. Erectile function not disturbed in the mainstream of our patients (Table 4).

The gross pathological evaluation of the mesorectum revealed a complete mesorectum (grade 1) in 22 patients, nearly complete (grade 2) in two patients, and incomplete (grade 3) in one patient only. The mean number of harvested lymph nodes was 17.1 ± 8.1 , range 9–42 nodes. Regarding the microscopic assessment of the specimen, eight cases were stage T1/T2N0, 13 cases were stage T3/T4N0, and four cases were stage T any N1–2. Circumferential margin distance (CMD) was ≥ 1 mm in 23 cases and < 1 mm in two cases only. The mean distal margin distance was 1.9 ± 1.1 , range 0.7–5 cm (Table 5).

Discussion

There are two basic points should be taken into consideration during rectal surgery: nerve-sparing procedures and oncological competency of the specimen. The most popular and serious PO complication in patients with rectal cancer is a local

recurrence. Total mesorectal excision was established to decrease the rates of local recurrences and improve the survival as well as to maintain a suitable quality of life. The best features of low and mid rectal cancer management concentrate on achieving optimal oncologic outcomes while maintaining the maximum quality of life. The surgeons are well aware of the technical difficulty in operating on a low rectal cancer to cure the patient and avoid local recurrences as well as a permanent colostomy. However, the optimal surgical approach to achieve this is unclear [15]. Laparoscopic approaches are usually supposed to have superior results than open approaches. However, newly, two randomized controlled trials (RCTs) (ACOSOG Z6051 and AlaCaRT) established that LapTME failed to meet the standard for superiority for the pathologic outcomes when compared with the conventional open procedures for low and mid rectal cancer patients [16]. These results may be attributed to the fact that TME can be very difficult to be completed laparoscopically in the deep pelvic angles that necessitate complex maneuvers to reach the extremes of the pelvis [17]. The above-mentioned RCTs revealed that a new different maneuver such as TaTME or robotic surgery will improve the efficacy of LapTME techniques [18].

In patients with mid or low rectal cancer, different transanal procedures have been implemented over the last years to overcome the limitations of LapTME. Transanal TME is a new developing technique with the crucial purpose of improving the oncological quality of surgery and precluding pelvic nerve injury [19]. In comparison with LapTME, TaTME delineates the DRM more precisely, with good visualization of the caudal end of the rectum, and permits the surgeon to achieve dissection in the deep pelvis without a challenging retraction (even in obese or male patients with deep and narrow pelvis) [20].

Based on the results of the current study, TaTME had a mean operative time of 143 ± 17.9 , range 130–190 min, and

Table 2 Operative collected data

Data	Strata	Findings
Operative time (min)		143 ± 17.9 (130–190)
Blood loss (ml)		70.3 ± 78.4 (50–500)
Temporary protective stoma, <i>n</i> (%)	Colostomy	2 (8%)
	Ileostomy	20 (80%)
	Total	22 (88%)
Conversion from lap to open, <i>n</i> (%)	Bleeding	1 (4%)
	Difficult pelvis approach	0.0
	Total	1 (4%)
Method of the anastomosis, <i>n</i> (%)	Hand-sewn	3 (12%)
	Circular stapler	22 (80%)
Intraoperative complications	Presacral bleeding	1 (4%)
	Ureter injury	0.0
	Small bowel injury	0.0
	Vaginal wall injury	0.0

Data are presented as mean $\pm$ SD and numbers; ranges and percentages are in parenthesis

Table 3 Postoperative collected data

Data	Strata	Findings
Hospital stay (days)		6.9 ± 2.6 (5–10)
Days to Foley removal		2.4 ± 2.1 (2–5)
Bowel function (days)	Flatus	1.5 ± 0.9 (2–3)
	Stool	2.7 ± 1.5 (2–5)
PO complications*, <i>n</i> (%)	Bleeding	2 (8%)
	Anastomotic leakage	1 (4%)
	Ileus	2 (8%)
	Urinary tract infection	1 (4%)
	Wound infection	2 (8%)
Readmission after discharge, <i>n</i> (%)	Fever	1 (4%)
	Wound infection	1 (4%)
	Adhesive bowel obstruction	1 (4%)
Follow-up (months)		28.6 ± 5.9 (7–36)
Recurrence (%)	Disease-free	22 (88%)
	Systemic	2 (8%)
	Local + systemic	1 (4%)

Data are presented as mean ± SD and numbers; ranges and percentages are in parenthesis.*one patient may have more than one complication

a mean conversion rate 1/25 (4%). In our study, the observed total number of PO complications was eight (one patient may have more than one complication), the mean hospital stay 6.9 ± 2.6 days, range 5–10 days, and the rate of readmission in the 30 PO days was 3/25 (12%). With regard to the operative outcomes, in comparison with the results of LapTME in the study done by Denost et al., TaTME showed comparable results in the total hospital stay days and readmission rate [21]. However, a significantly shorter operation time was observed for TaTME in our study. One explanation is that during LapTME the distal part of TME takes a long time for meticulous dissection in the deep and narrow pelvis. Also, we evaluated the explanations for conversion of the procedure from open to lap. In our study, only one patient 1/25 (4%) underwent conversion to an open approach because of technical difficulty, whereas Bin et al. mentioned in their study that

eight patients in the LapTME group 8/17 (47%), their operations were converted from lap to open [22]. The significantly higher conversion rate in the LapTME in the previously mentioned study was principally due to the difficult pelvic approach for TME in obese male patients with narrow pelvises; there is no doubt that TaTME will overcome these limitations to decline the incidence of conversion [22].

In our study 22/25 (88%) of patients underwent proximal protective stomas. A comparative study of Chen et al. revealed that 46/50 (92%) of patients in TaTME group underwent a proximal protective enterostomy compared to 91/100 (91%) of patients in LapTME group (*P* value 0.839) [23]. However, the absence, as well as the type of the stoma, did not affect the overall outcome in those patients. Our study showed a comparable rate of intraoperative complications and a lesser incidence of PO complications in the TaTME group when

Table 4 IPSS and IIEF questionnaires used to analyze the urinary and sexual dysfunction

Data	Strata	Findings
IPSS	Preoperative	3.20 ± 2.2
	1 month PO	6.52 ± 6.1
	1 year PO	3.25 ± 2.4
IIEF (erectile dysfunction 12-months PO year)	No erectile dysfunction	18
	Light erectile dysfunction	0
	Moderate erectile dysfunction	1
	Heavy erectile dysfunction	1
	Non-sexually active patients	2
	Patients refused to participate	3

Data are presented as mean ± SD and numbers; ranges and percentages are in parenthesis. *IPSS* International Prostate Symptoms Score, *IIEF* International Index of Erectile Function, *PO* postoperative

Table 5 Pathological data of excised specimens

Data	Strata	Findings
Size (cm)	Diameter in its longest axis	2.5 ± 1.4 (1.2–6)
Removed lymph nodes	Positive	5 (20%)
	Negative	20 (80%)
	Total number of resected lymph nodes	16.1 ± 5.1 (9–42)
Perineural invasion	Yes	2 (8%)
	No	23 (92%)
Vascular invasion	Yes	8 (32%)
	No	17 (68%)
Differentiation	Well	2 (8%)
	Moderate	20 (80%)
	Poorly	3 (12%)
Distal margin distance (cm)		1.9 ± 1.1 (0.7–5)
Circumferential margin distance, <i>n</i> (%)	< 1 mm	2 (8%)
	≥ 1 mm	23 (92%)
TME quality, <i>n</i> (%)	Complete	22 (88%)
	Near complete	2 (8%)
	Incomplete	1 (4%)
Pathological stage, <i>n</i> (%)	T1N0	1 (4%)
	T2N0	7 (28%)
	T3N0	12 (48%)
	T4N0	1 (4%)
	T any N1–2	4 (16%)

Data are presented as mean $\pm$ SD and numbers; ranges and percentages are in parenthesis

compared with the LapTME in the study done by Joseph et al. [5]. It is noticeable that the direction for a minor incidence of PO complications in the TaTME may explain the minor readmission rate for these patients if compared with LapTME patients in other studies. Regarding the types of PO complication, our study showed that the rate of bleeding 2/25 (8%), anastomotic leakage 1/25 (4%), ileus 2/25 (8%), urinary tract infection 1/25 (4%), and wound infection 2/25 (8%). These results are comparable with the outcomes of the study done by Fernandez et al. about comparing the short PO outcome of TaTME and LapTME [24].

About PO and sexual and urinary status, our results agree with Bin et al., who had found a noticeably lower rate of PO urinary troubles (retention, dysfunction, and infection) among patients of the TaTME group in their study that compares between LapTME and TaTME [22]. The most probable clarification is that TaTME offers a better anatomical delineation of the pelvis, permitting more precise dissection between the pelvic fascia and the mesorectum, which result in protection of the autonomic nerves, and hence leads to a lower rate of PO urinary morbidities [20]. On the other hand, Annibale et al. mentioned that their urinary dysfunction analysis displayed a deterioration of the IPSS scores after 1 month of surgery in Lap and TaTME; however, these parameters were normalized after 12 months postoperatively [25]. Keller et al. (2016)

found that the rate of bladder and sexual morbidities after ordinary rectal surgery is 73 and 94%, respectively [18]. They attributed these PO troubles to the intraoperative injury to the sacral splanchnic nerves or the hypogastric nerves or both during ligation of the IMA, where some fibers of the pre-aortic autonomic nerves may be imperfectly handled and damaged [21]. As well Simillis et al. mentioned that bladder function markedly improved within the 1st 6 months afterward LapTME and 3 months following TaTME, with a better PO IPSS score for TaTME compared to LapTME [26]. This goes hand in hand with the outcomes in our present study in which preoperative IPSS score was 3.20 ± 2.2 and 12-months PO was 3.61 ± 2.4 .

In addition, in terms of oncological outcomes, we found that our patients had a high rate of complete grade specimens 22/25 (88%) and long CRM ≥ 1 mm in 23/25 (92%). Our study showed that the noteworthy advantage of TaTME is attaining a high rate of complete mesorectal quality. Complete or even nearly complete mesorectum after TME is a documented and universally recognized optimistic prognostic factor. There is no doubt that incomplete fascia is accompanied with undesirable oncological outcomes [27]. Recent studies suggested a CRM < 1 mm is predictive of a high danger of distant metastases and worst survival; however, CRM < 2 mm is predictive of high risk of local recurrence and a DRM

of at least 2 cm must be a therapeutic target [28]. In comparison with other studies about LapTME, where the rate of cases with complete mesorectum was 83.4%. Also, nearly complete plus complete mesorectum was 88.2%. So, for patients with lower or middle rectal cancer, TaTME can attain a nearly complete or complete mesorectal excision easily, compared with LapTME. No doubt that the condition of CRM is the chief indicator of the outcome of patients' rectal cancer who are undergoing TME [29]. In regard to Wasserberg and Nagtegaal et al., a higher quality of the excised mesorectum will be reflected in longer survival [28, 29].

Conclusion

The current prospective study provides confirmation that it is possible and safe to use the “down-to-up” TaTME in the surgical management of lower and mid rectal cancers. This procedure definitely overcomes the technical restrictions of transabdominal laparoscopy in the dissection of the distal part of mesorectum and helps surgeons to complete the technique efficiently. Transanal TME has an excellent clinical and pathological outcome.

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Compliance with Ethical Standards

Conflicts of Interest The authors declare that they have no conflicts of interest.

Patient Consent Patient informed consents were obtained before the operation, as with all procedures.

Ethics Approval This data collection was approved by the Ethical Committee of our hospital.

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