Single-team transanal total mesorectal excision for mid and lower rectal cancer: Snow Leopard approach

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Received: 20 June 2023
Revised: 20 July 2023
Accepted: 26 July 2023
Published: 6 October 2023

The Egyptian Journal of Surgery 2023, 42:788–794

Background
Transanal total mesorectal excision (TaTME) is a recently developed technique to overcome difficulties of rectal cancer resection spatially in male patients, large tumors, high body mass index, and low rectal cancer.
Methods
From April 2018 to March 2021, 30 patients were included. Single-team TaTME was done, using traditional Laparoscopic instruments and a two-dimensional HD camera, starting with the abdominal phase. The analysis focused on operative data and short-term surgical outcomes.
Results
30 taTME procedures were performed, 16 (53.3%) males and 14 (47.7%) females, with a mean age of 50.43 years. There were 21 (70%) patients with tumors in the middle part of the rectum and 9 (30%) patients with tumors in the low rectum. All patients received Long Course Neoadjuvant CRT. The duration of hospital stay was 5.27±1.08 days. The median operative time was 135.27 min the estimated blood loss was 133.67 66.59 ml.
Complete mesorectal excision was achieved in all patients. Circumferential radial margin (CRM) was negative in all cases. 1 (3.3%) case needed conversion to an open approach. The overall postoperative complications rate was 6.6% (2 cases). Postoperative ileus occurred once, and anastomotic leakage occurred in one patient.
Conclusions
In experienced hands, TaTME is a safe technique but still a challenging procedure. The author suggest that single team approach is not time-consuming (operative time was less than what had been reported by other authors using the two-team approach), and dissection should be done through the proper plane (TME planes) lateral to the urosacral ligament in females and its analog in males named prostatosacral ligament as described in the Paper to minimize the incidence of local recurrence.

Keywords:
rectal cancer, Snow Leopard approach, total mesorectal excision, transanal

Egyptian J Surgery 42:788–794

1110-1121

Introduction

Rectal cancer (RC) is a frequent malignant tumor. The Progress in radical surgery has been driven by an improved understanding of the anatomy, improved technology, and an increased appreciation of the quality of life [1].

Total mesorectal excision (TME) since first described by Heald and colleagues in 1982, became an evolution in rectal surgery as it decreases locoregional recurrence rates and increases survival [2].

Laparoscopic TME (LapTME) has been proven by many randomized control trials and Systemic reviews to offer operative and oncological outcomes compared with open TME with less blood loss, less postoperative ileus, fewer wound infections, and shorter hospital stay [3–5].

LapTME may still be challenging in patients with complex cases due to difficulties in the visualization of the pelvic anatomy and surgical manipulation with the rigid laparoscopic instruments, which lead to a higher risk for conversion to open surgery, lower quality of resection margins, prolongation of

operating time and increase the risk for injury. These problematic cases include low rectal tumors, dense adhesions, narrow pelvis, male patients, tumor fixity, and high body mass index (BMI) [6–8]. Transanal total mesorectal excision (TaTME) was introduced to deal with the challenges of laparoscopic rectal surgery. The first TaTME case with laparoscopic assistance was reported by Sylla and colleagues [6].

Our study aimed to evaluate the feasibility and short-term outcomes of single-team TaTME of rectal cancer Using traditional Laparoscopic instruments, Intermittent Flow insufflator, and two-dimensional HD Camera.

Methods

The study was carried out on patients with middle or lower-third rectal cancer.

All patients with T4 tumors not responding to neoadjuvant chemo-radiotherapy, multiple colorectal tumors, synchronous abdominal organ resections, or Patients under 18 years of age were excluded from our study.

The site of the tumor, its lower edge and extensions, and the presence of regional lymph node or distal metastases were evaluated through careful history taking, physical examination, and imaging modalities.

Over 5 weeks, the patients received Neoadjuvant therapy including 28 fractions totaling 50.4 Gy and Fluorouracil (5-FU) infusions at the first and fifth weeks. TATME was done 6-8 weeks after completion of the neoadjuvant therapy.

Operative techniques

Trans-abdominal phase

Steep Trendelenburg position used with the left side tilted upwards. In female patients, a uterine sound was used to get a better view of the pelvis.

In all patients, an operation is preceded by a routine ureteric catheterization to help in the identification and minimize intraoperative ureteric injuries.

Trans-abdominal dissection was done by using the slandered medial-to-lateral approach except for laparoscopic port positioning [7].

We used five port approaches designed by one of the supervisors. A 10 mm port for the camera 1 cm above the umbilicus, a 12–15 mm port for the right working hand in the right iliac fossa, and a 5 mm port as a left working hand in the midline midway between the xiphoid process and umbilicus. A 5 mm port is inserted at the left mid-clavicular line in the left iliac fossa and a 10 mm port above the symphysis pubis for the assistant hands. Figure 1.

Transanal phase

Transanal phase

Modified Lloyd Davis position used to start the trans-anal part. First, we properly expose the anal canal by taking four silk sutures at 3, 6, 9, 12 o'clock. Figure 2

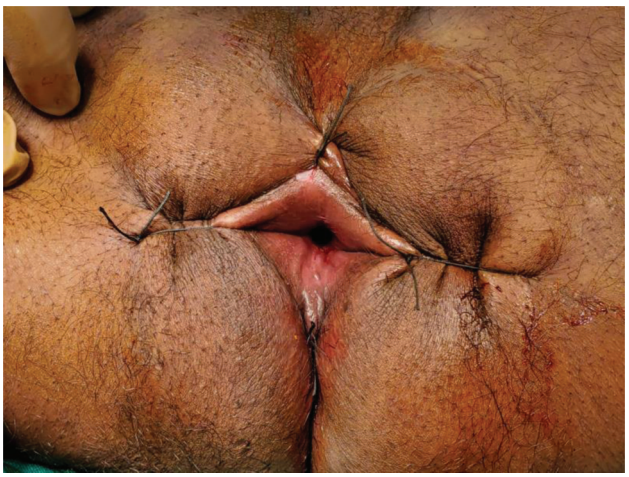
Following that, a purse-string suture is placed distally of the tumor with a sufficient safety margin.

To reach our dissection plane just outside the mesorectum, we then make a circumferential incision (above the anorectal junction), which was

Figure 1

Trocar positions.

Figure 2



anal canal exposure.

sufficient in cases of mid-rectal tumors. Intersphincteric dissection takes the role of proctectomy in cases with lower rectal cancer.

The open surgical trans-anal approach is used to obtain the plain before applying the Gel point micro access platform. Figure 3

Through an intermittent insufflator, insufflation was performed at a pressure of 15 mmHg. We chose to employ a zero camera together with standard laparoscopic tools since it was discovered to provide better end-on vision, there was no need to modify the light source, and it has kept the surgeon's working hands out of the way.

Farag and colleagues [8] described an uterosacral ligament analog in males, named the prostate-sacral ligament. They stated that this ligament has various folds that are significant, such as partitioning the inner pelvic space 'the TME holly plane' into an innermost plane between the ligament and the rectum and mesorectum and outer part lateral to this ligament (Fig. 4).

The lateral circumferential edge of the TME plane would be extremely close during dissection medial to this ligament, and it would not be simple to connect the TATME to the appropriate plane created by abdominal dissection.

Finally, the specimen was delivered trans-anally or through a small Pfannenstiel incision if the specimen was quite large.

Anastomotic technique

A colorectal or coloanal anastomosis was performed with a trans-anal circular stapler; if this was not possible, a hand-sewn coloanal anastomosis was performed. In 18 individuals, ileostomy or colostomy diversion was performed after initial anastomosis; 12 patients underwent no diversion. Patients who needed diversion include the patients with intersphincteric resection (8 cases), the first cases in our study (To avoid the possible complication of this new technique and patients suffering from intraoperative leakage during anastomotic testing (2 cases).

Postoperative policy

We adopted the enhanced recovery care protocol for all patients. Postoperative information includes total operating time, pathological staging, the number of lymph nodes collected, the extent of the resection, and the immediate postoperative outcome within 6 months (days spent in the hospital, complications, rate of reoperation, rate of readmission, and 30-day mortality).

All specimens' pathology reports were gathered. Sex, age, proximal, distal, circumferential, number of L.N. retrieved, and positive L.N. data were all employed in the statistical analysis.

From the patient's admission the night before the procedure, until the patient was discharged, the length of hospital stay was measured in days.

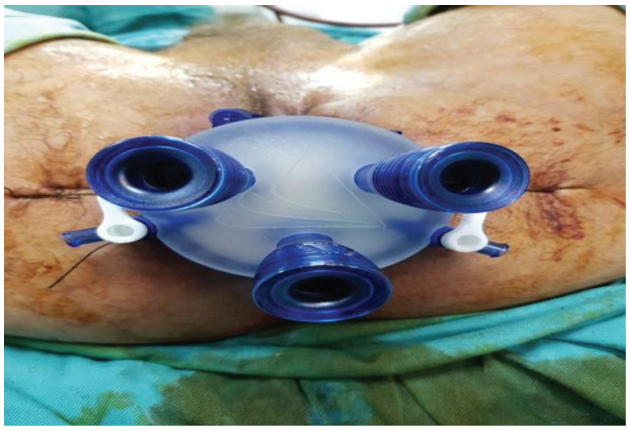
Early postoperative problems as well as intraoperative complications such as haemorrhage, ureteric injury, various urogenital injuries, and conversion to the open method were recorded.

Results

Demographic distribution

30 patients with mid and low-grade rectal cancer (16 men and 14 women) were included in this cohort study.

Figure 3



Gelpoint port application.

Figure 4

Proper dissection plane between the ligament and pelvic fascia (Black arrows point to the ligament, and the white arrow refers to the proper lateral plane) [8].

Their ages ranged from 33 to 65 years, with a mean of 50.43. (Table 1)

There were 21 (70%) patients with tumors in the mid-rectum. On the other hand, there were nine (30%) patients with tumors located in the low rectum. All patients received preoperative systemic treatment (Neoadjuvant chemoradiation) Table 2.

Our study had 22 cases with low anterior resection (proctectomy was above the Anorectal junction) and 8 cases with intersphenteric dissection.

The mean distal safety margin was 2.08±0.4. The mean proximal safety margin was 14.37±2.87 cm. The circumferential radial margin (CRM) was complete in all patients. (Table 2).

The mean operative time was 135.27 18.3 (109–179) minutes, and the estimated blood loss was 133.67 66.59 (50–400) ML.

Table 1 Patient's characteristics (BMI, body mass index; ASA, American Society of Anesthesiologist)

Variables	Total patients (*N*=30)
Age, years	50.43
Sex	
male	16 (53.3%)
female	14 (47.7%)
BMI, kg/m^2	28.4±4.5
ASA classification	
ASA score 1,2	22 (73.3%)
ASA score, ≥3	8 (26.6%)

Table 2 Pathological characteristics

Variables	Total patients (*N*=30)
Pathology:	
Adenocarcinoma	30 (100%)
Mucoid differentiation	6 (20%)
complete pathological response	3 (10%)
Clinical staging (AJCC) of the rectal cancer	
Stage 0 (complete pathological response)	3 (10%)
Stage I	3 (10%)
Stage II	9 (30%)
Stage III	14 (46.6%)
Stage IV	1 (3.3%)
Number of lymph nodes	13.27±5.9
Number of positive lymph nodes	2.4±3.77
Tumor site	
Mid rectum	21 (70%)
Lower rectum	9 (30%)
resection margin	
proximal (CM)	14.37±2.87
distal (CM)	2.08±0.4

The mean hospital stay was 5.27±1.08 days. This was due to adopting a fast-track protocol, and the mean Total hospital cost was 46.43±1.81 (X 1000 L.E) (Table 3).

Despite our initial experience with this approach, only 1 (3.3%) case was converted to an open approach. Massive bleeding occurred during the dissection of IMA with failure of trials for laparoscopic control of the bleeding.

The overall postoperative complications rate was 6.6% (2 cases). Postoperative ileus occurred once, and the patient was managed conservatively.

Anastomotic leakage occurred in one patient. The patient suffered from high-grade fever, abdominal distention, and feculent discharge from the pelvic drain on the third day postoperative, and the patient was managed operatively by exploration. Re-anastomosis and diverting colostomy were done.

Discussion

TaTME is a fundamentally distinct 'down-up' method that still requires assistance and laparoscopic or robotic dissection. TaTME is supposed to be valuable in difficult cases, especially in obese and male patients, irradiated pelvis, and bulky low to mid-RC [9].

Trans-anal technique, in general, allow for improved visualization of the distal rectum and make the distal resection border obvious. Letarte and colleagues reported that the trans-anal approach allows pelvic dissection with limited traction on the rectum, which decreases the risk of specimen perforation or fragmentation [10].

Table 3 Intra and postoperative data

Variables	Total patients (*N*=30)
Operation type	
Low anterior resection	22 (73.3%)
Intersphenteric resection	8 (26.6%)
Diversion (ileostomy)	18 (60%)
No diversion	12 (40%)
Duration of surgery, minutes	135.27±18.3
Estimated blood loss, ml	133.67±66.59
Length of hospital stay, days	5.27±1.08
Total hospital cost per case (X 1000 L.E)	46.43±1.81
conversion to open surgery	1 (3.3%)
Postoperative complication (CDC)	
I	1 (3.3%)
III b	1 (3.3%)

Complete mesorectal excision was performed with a 100% success rate in the current study, with a distal safety margin of 2.08±0.4 and retrieved lymph nodes of 13.27±5.9, respectively. In their study of 56 patients, Tuech and colleagues found that 84% of patients had complete mesorectal excision (intact), 16% had it almost intact, the distal safety margin was 1 cm, and there were 12 retrieved lymph nodes [11].

Rouanet and colleagues study on 30 patients had a distal safety margin of 0.9 cm, 13 recovered lymph nodes, 100% (intact) full mesorectal excision, and 0% almost intact. In their study of 26 patients, Muratore and colleagues found that 88.5% of patients had complete mesorectal excision (intact), 11.5% had it almost intact, and 10 lymph nodes were retrieved. In their analysis of 20 cases, Buchs and colleagues found that 94.1% of the mesorectal tissue was completely removed (intact), 5.9% was almost completely removed, the distal safety margin was 2.14 cm, and 23.2 lymph nodes were retrieved [12–14]

In 2021 a large cohort study based on the International Ta TME registry reports positive CRM in 4.0%, positive DRM in 1.0%, complete specimen in 80.9%, and near complete TME in 10.3% [15]. Also, a Recent Canadian study showed positive CRM in 7.1%, positive DRM in 2.5%, and complete specimen in 92.9% [16]. A meta-analysis compared the oncological outcomes between ta TME and lap TME and found ta TME group had a significantly higher rate of complete or nearly complete resection and less positive CRM involvement with no significant difference regarding the DRM and positive DRM [17].

A systematic review in 2019 confirmed higher quality of specimens with longer distal resections margins Vignali and colleagues [18]. Recurrence with TATME, however, was described as being more frequent, multifocal, and widespread by Wasmuth and colleagues [19]. To connect the dissection plane from below with the proper TME holly plane developed abdominally, the proper dissection plane must be developed lateral to the prostate-sacral ligament in males and the uterosacral ligament in females between those ligaments and pelvic fascia. This requires using both the ligaments medially and the fascia laterally as landmarks for the proper TME plane. The lateral CRM may be in danger if such ligaments are not identified and divided as part of the radical rectum resection.

From our point of view, we think that the dissection of the rectum between those ligaments (innermost pelvic plane) rather than in the proper dissection plane lateral to those ligaments explains the multicenter recurrence from Norway. Another explanation was that the rate of preoperative chemoradiotherapy was 21% is significantly lower than the national Norwegian chemoradiotherapy rate [20].

As regards the operative outcomes, we have acceptable operative outcomes with no odds of complication with a relatively shorter operation time (135.67 18.3 min) with average hospital stay and blood loss. The previously mentioned meta-analysis showed that ta TME had a significantly shorter operation time. One explanation was that taTME could be performed by two teams simultaneously. However, 6 of the included studies in this meta-analysis showed a shorter operation in one or two team surgeries Chen and colleagues [17].

The average operating duration in Tuech and colleagues investigation of 56 patients was 270 min in studies by Muratore and colleagues and Buchs and colleagues on 20 cases and 26 patients, the mean operating time was 315.3 min and 241 min, respectively Roodbeen and colleagues, Ma and colleagues, Vignali and colleagues [11,13,14]

Even though the above-mentioned studies were done with two teams approach, we think that a single-team approach is not time-consuming (operative time was less than what had been reported by other authors using the two-team approach) as laparoscopic dissection leads to exposure and protection of ureters and nerves from the abdominal side and minimize the trans-anal needed dissection which results in a shorter time and lower complication. Another point that may explain this difference is the position of the patient in the two teams' surgery is suboptimal for both teams, as patients were put in a position midway between the Trendelenburg position (needed in the abdominal phase) and the modified Lloyd Davis position (needed in trans-anal phase).

Regarding estimated blood loss, the mean blood loss volume in the current study was 133.67±66.59 cc. The average amount of blood lost in De Rosa and colleagues study was 175±100cc, which is higher than our finding [21]. The mean blood loss measured by Chen and colleagues in research including 50 patients was 68.0±89.6 cc, which is less than our finding [22].

Regarding hospital stays, the findings from the current study showed 5.27±1.08 days. In their study of 20 patients, Buchs and colleagues found that the average hospital stay was 7 days; in their study of 56 patients, Tuech and colleagues found that the average hospital stay was 10 days; and in their study of 30 patients, Rouanet and colleagues found that the average hospital stay was 14 days. These findings were longer than our mean, which was 5.27±1.08 days [11,12,14].

In our study, we experienced a conversion to open surgery in one case due to technical difficulties, which we considered very satisfying in our early experiences with this new technique. Ta-TME considered to have a lower conversion rate as it overcomes the suboptimal visualization and exposure problems, and the defect in abdominal dissection, which was led to conversion, can be overcome by the trans-anal approach van Oostendrop and colleagues, Hol and colleagues [23,24].

Among intraoperative complications, in the present study, we used a CO_2 intermittent insufflator, and we found that it gives better results with the fogging of the camera and also less hypercarbia. In 2019, Bolshinsky and colleagues [25] reported in their study three cases of CO_2 embolism, and they used a constant flow insufflator.

Regarding postoperative complications, in the present study, we had complications in the form of leakage and diversion in one case (managed by loop colostomy), another case developed ileus (managed conservatively), and a case of conversion to open with an overall 10 percent while no complication represents 90%.

Tuech and colleagues in their study of 56 patients, the complications rate was 26%, Muratore and colleagues in their study of 26 patients, the complications rate was 26.9%, Buchs and colleagues in their study of 20 cases, the complications rate was 30%, Rouanet and colleagues in his study on 30 patients complications rate was: 10% intraoperative and 30% postoperative, which all was more than our overall complication rate of 10% [11–14]

Penna and colleagues found an overall anastomotic failure rate of 15.7% in Ta-TME cases [26]. Many studies show no statistical difference in anastomotic leakage between Ta TME with Lap TME groups Penna and colleagues, Detering and colleagues [27,28]

In our study, we did not report a urologic injury. Sylla and colleagues reported 39 urological injuries during ta TME operations performed by 32 teams over seven years [29].

We called this Single team approach 'A Snow Leopard technique' because the Snow Leopard is one of the cleverest Single hunters in the Animal Kingdom.

Limitations of the study

To evaluate the effectiveness of the procedure in rectal resection, more patients must be included. Additionally, a longer time of follow-up is required to identify long-term results and complications.

Functional evaluation following surgery; urological, sexual, and continence evaluations required more time.

Conclusion

On experienced hands, TaTME is a safe technique but remains a challenging procedure with little room for error.

We suggest that the single-team approach is not time-consuming (operative time was less than what had been reported by other authors using the two-team approach). We had the impression that this technique should be used for resection of mid and lower RC as a completion operation after laparoscopic dissection and exposure/protection of ureters and nerves from the abdominal side rather than an operation on its own.

Acknowledgements

Financial support and sponsorship

Nil.

Conflicts of interest

A large multicenter trial comparing our suggested one-team approach as compared with the two-team approach may be needed.

Long-term results still have to be awaited to show noninferiority to open surgery and other minimally invasive procedures.

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