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ORIGINAL ARTICLE

Quality of Life After Surgery for Rectal Cancer: a Comparison of Functional Outcomes After Transanal and Laparoscopic Approaches

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Abstract

Background The aim in rectal cancer surgery is to cure with minimal impact on the quality of life. Transanal total mesorectal excision (TaTME) seems to be a safe and feasible alternative to laparoscopic TME (LaTME). However, limited data are available on the functional outcomes after TaTME. We aimed to study the quality of life (QoL), through questionnaires, comparing different functional outcomes after TaTME and LaTME.

Methods Consecutive patients who underwent TME between 2010 and 2017 at Slagelse Hospital, Denmark, were included based on certain criteria. Patients were divided according to the surgical technique (TaTME vs LaTME). The study was based on telephone interviews using the questionnaires: EORTC-QLQ C30, EORTC-QLQ C29, Low Anterior Resection Syndrome (LARS) score, and International Prostate Symptom Score (IPSS) for male patients. Patients in this study had a follow-up time of at least 8 months.

Results Overall, global health status was similar between the groups ($p = 0.625$). Anorectal symptoms were significantly in disfavor of TaTME including buttock pain ($p = 0.011$), diarrhea ($p = 0.009$), clustering of stools ($p = 0.017$), and urgency ($p = 0.032$), yet total LARS score was comparable ($p = 0.054$). We found comparable sexual results and an overall higher satisfaction with urinary status in TaTME group ($p = 0.010$), yet no difference in IPSS symptoms ($p = 0.236$).

Conclusions Anorectal dysfunction may occur after total mesorectal excision (TME) regardless of surgical technique, frequently more in after TaTME. The LARS symptoms and the overall quality of life status were however comparable. TaTME had a positive impact on the reported QoL, related to urinary symptoms.

Keywords Rectal cancer · TaTME · LaTME · Quality of life · Surgery · Functional results

Introduction

TaTME has over the last decade been proved a feasible and safe surgical method in the treatment of mid and low rectal cancer.[1–3] The bulk of published case series and comparative studies suggests that it overcomes some of the technical difficulties associated with the rigid instruments used in laparoscopic total mesorectal excision (LaTME)—particularly in obese, male patients with a narrow pelvis and bulky mesorectum.[1,2,4–6]

Short-term oncological outcomes show comparable resection margins (circumferential CRM and distal DRM) and comparable macroscopic specimen quality, both factors well known to be of oncological importance.[7,8]

Potential short-term benefits of TaTME over LaTME include lower conversion rates, lower anastomotic leakage rates, and fewer wound-related complications. The improved visualization allows a precise dissection and nerve preservation in TaTME, thus potentially an improvement in the urogenital function compared to LaTME.

During TaTME, a more precise selection of the distal resection margin is possible and sphincter-saving surgery is thus feasible even in very low tumors.[9] Low anastomosis and prolonged dilatation of anal sphincter in TaTME on the other hand can potentially worsen anorectal function. Testing the same theory of the negative effect of prolonged anal dilatation

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in transanal endoscopic microsurgery (TEM), Allaix et al.[10] did not show any long-term negative impact on anorectal function.

Regardless of the approach, surgery of the lowermost part of the rectum is associated with deterioration of the bowel function known as low anterior resection syndrome (LARS) and urogenital dysfunction.[10] The published functional outcomes after TME are highly variable, and it has been proposed that height of the tumor, neo-adjuvant chemoradiation, and type of anastomosis are contributing factors to the functional outcomes.[11–13]

Our aim in this study was to compare the quality of life, bowel function, and urogenital functions between TaTME and LaTME, performed at our institution.

Materials and Methods

This study is from Slagelse Hospital, Department of Surgery, which is a large volume colorectal unit. We have adopted TaTME 5 years ago and since then standardized and applied the technique to every patient where TME was indicated. We have previously published our experience[3,9] and maintain a prospective database registering all patients undergoing TaTME. The database is approved by the Danish Data protection agency. In this study, we included all consecutive patients who underwent minimal invasive TME between 2010 and 2017. Patients who underwent LaTME were traced via the database of the Danish Colorectal Cancer Group (DCCG).[14] From our database, we included patients of both genders, who had the diverting ileostomy reversed. We excluded patients with anastomotic leakage and those who could not participate because of dementia or comorbidities.

Patients meeting selection criteria were divided according to the surgical technique (TaTME vs LaTME). The study was based on telephone interviews using the questionnaires: EORTC-QLQ C30, EORTC-QLQ C29, low anterior resection syndrome (LARS) score, and International Prostate Symptom Score (IPSS) for male patients. Patients in this study had a mean follow-up time of 44.88 months (range 8–98 months).

Surgery

We have previously published our practice in detail for the preoperative workup and the details of the surgical technique in both LaTME and TaTME procedures.[3] The TaTME was nearly always performed as one-team approach, with few exceptions where the transabdominal and transanal phases overlapped for short periods during the procedure. Patients selected for anastomosis had a reasonable anorectal sphincter function, assessed during the preoperative outpatient visit by history taking and digital rectal examination. All patients were informed about LARS symptoms and the possibility to choose a permanent stoma. All patients included in this study had a side-to-end anastomosis.

Diverting Ileostomy

Our routine is to always perform a diverting loop ileostomy following TME. The usual practice for stoma reversal at our institution is to wait 3 months or until the completion of adjuvant chemotherapy if this was indicated. In some cases, we have performed an early stoma closure within 2 weeks from the index procedure. Few patients in this study have undergone early stoma closure. In any case, the diverting stoma was closed after careful evaluation of the anastomosis for integrity and possible stricture through a rigid proctoscopy or flexible sigmoidoscopy, immediately prior to closure.

Quality of Life Assessment

We based our assessment on direct telephone interviews. We preferred this method to be able to clarify details in the questionnaires for patients and ensure an accurate answer for every item. The two interviewers were blinded to the procedure performed for each patient (TaTME vs LaTME). We used the following validated questionnaires:

EORTC QLQ-C30 (Version 3.0)

This questionnaire measures the QoL of cancer patients using five functional scales (physical, role, emotional, cognitive, and social), three symptom scales (fatigue, pain, nausea), a global health status/QoL scale, and several single items assessing additional symptoms commonly reported by cancer patients (dyspnea, loss of appetite, insomnia, constipation, and diarrhea) and perceived financial impact of the disease. The questionnaire has 4-point scales for all items except for global health status where there are 7-point scales. We have converted these *raw scores* to *scale scores* ranging from 0 to 100 according to the EORTC scoring manual.[15] A high *scale score* represents a higher response level. Thus, a high score for a functional scale represents a high/healthy level of functioning, and a high score for the global health status/QoL represents a high QoL. Conversely, a high score for a symptom scale/item represents a high level of symptomatology/problems.[16]

EORTC QLQ-CR29

This is a complementary module to EORTC QLQ-C30, designed for use among colorectal cancer patients. The questionnaire consists of 29 items, constituting 10 items in four scales (body image, urinary frequency, blood and mucus in stool, stool frequency), in addition to 19 single items. Individual scores and the measured *raw scores* from *scale scores* were converted to scores ranging from 0 to 100 in the same way as

for EORTC QLQ-C30 using the EORTC scoring manual.[15] On the symptom scale, a higher score indicates worse health-related quality of life, and on the functional scale, a higher score indicates better health-related quality of life.[17] For sexual interest scales, the score conversion was done according to symptom scale algorithm for these two scales to be interpreted as functional scales (i.e., a higher score is better).

Low Anterior Resection Syndrome

This scoring system is a simple tool for evaluation of anorectal function. The scoring system is validated and measures incontinence for flatus and stool, frequency of bowel motion bowel, stool clustering, and urgency. Three score ranges are obtained, and the existence and severity of LARS are obtained: no LARS (0–20), minor LARS,[18–26] major LARS (30–42).[27,28]

International Prostate Syndrome Score

This questionnaire is designed to measure the quality of urinary function in male patients. It is based on seven symptoms related to urinary function with a five-scale system that can be answered by "none" (score 0) to "almost always" (score 5). The symptoms assessed are incomplete emptying, frequency, intermittency, urgency, weak stream, straining, and nocturia. The quality of urinary function is then graded as mild (scores 1–7), moderate (scores 8–19), and severe (scores 20–35). The questionnaire measures the quality of life due to urinary symptoms on a six-scale system ranging from delighted (score 0) to terrible (score 6).

Statistical Analysis

Baseline characteristics are presented by categories and data as means. Categorical variables were compared by Pearson's chi-squared test or Fisher's exact test when appropriate. Continuous variables were compared by Mann-Whitney U test. A p value < 0.05 was considered statistically significant. All analyses were performed using the software package SPSS version 24.0 (SPSS 24.0; SPSS Inc., Chicago, IL, USA).

Results

Patient Characteristics

Eighty-five out of 125 patients contacted met inclusion criteria. Forty patients were excluded for various reasons: failure to answer ($n = 13$), no wish to participate ($n = 4$), dementia ($n = 2$), disease recurrence ($n = 1$), currently in treatment for prostate cancer ($n = 1$), still had diverting ileostomy,[7] had new stoma ($n = 6$), death ($n = 6$). No statistically significant difference was found between the groups regarding the reasons for exclusion.

The 85 eligible patients were divided into two arms according to the surgical technique TaTME ($n = 49$) and LaTME ($n = 36$). Patient and tumor characteristics are shown in Table 1. No significant differences were found between the groups in terms of age, gender, body mass index (BMI), American Society of Anesthesiologists (ASA) score, tumor height, and the rate of neoadjuvant chemoradiation. A significant difference was however observed in the mean follow-up (22.69 vs 75.08 months, $p < 0.001$).

Disease characteristics showed comparable T (tumor) and M (metastasis) in the groups, whereas positive N (lymph node) status was significantly lower in the TaTME group (14 and 26 patients respectively, $p < 0.001$).

Pathological results did not differ significantly between the groups, yielding positive circumferential resection margin (CRM) in two patients from each group (4.1% and 47% respectively). No differences were found in macroscopic grading of the specimen according to Quirke's method (incomplete, nearly complete, complete).[7]

Questionnaires

EORTC QLQ-C30

Quality of life/the global health status was comparable in the two groups (Table 2). No significant differences were found on the functional scales including physical, role, cognitive, and social functioning. However, the reported emotional functioning was significantly in favor of LaTME ($p = 0.041$), as was symptoms of diarrhea ($p = 0.009$). The remaining symptom scales concerning fatigue, nausea, pain, dyspnea, insomnia, and constipation as well as financial difficulties were comparable.

EORTC QLQ-CR29

Buttock pain and taste were significantly in disfavor of the TaTME group ($p = 0.011$ and $p = 0.047$ respectively) as shown in Table 3. All other functional scales and symptoms were comparable including flatulence, fecal incontinence, and frequencies of mucus stool and urine. Sexual outcomes including impotence, dyspareunia, and sexual interest in both genders were similar in the two groups.

LARS

Table 4 summarizes the results of LARS score. Symptoms related to anorectal dysfunction were reported in both groups, and no significant differences regarding the overall severity, as reflected by the three categories in the LARS score, were found ($p = 0.589$). Mean of total LARS score was in disfavor

Table 1 Baseline characteristics

	TaTME (49)	LaTME (36)	*p* value
Age, mean ± SD	64.88 ± 9.645	62.42 ± 10.146	0.259
Sex			0.053
Male	37	16	
Female	12	20	
BMI, mean ± SD	26.57 ± 3.476	25.45 ± 4.811	0.217
ASA classification			0.130
ASA 1	21	17	
ASA 2	20	18	
ASA 3	8	1	
Tumor height, mean ± SD (cm)	8.35 ± 1.727	8.14 ± 1.885	0.599
Tumor height			0.643
< 6 cm from anal verge	4	2	
≥ 6 cm from anal verge	45	34	
Neoadjuvant chemoradiation, *n* (%)	8 (16.3%)	8 (22.2%)	0.492
Questionnaire timing* (months), mean ± SD	22.69 ± 10.308	75.08 ± 17.609	< 0.001
TNM classification			
T			0.625
T2	25	17	
T3	23	19	
T4	1	0	
N			< 0.001
N0	35	10	
N1	6	10	
N2	8	16	
M			1.000
M0	46	34	
M1	3	2	
Grading of mesorectum			0.460
Incomplete	6	8	
Nearly complete	7	4	
Complete	36	24	
CRM involvement, *n* (%)	2 (4.1%)	2 (4.7%)	0.751

BMI, body mass index (kg/m^2); *ASA*, American Society of Anesthesiologists score

*Time from stoma closure to questionnaire interview

of TaTME, yet this did not reach statistical significance (p = 0.054). However, clustering of stools and fecal urgency were in favor of LaTME and reached statistical significance (p = 0.017 and p = 0.032 respectively). Comparison of the groups regarding incontinence for flatus and liquid stools as well as bowel frequency did not yield any significant difference.

IPSS

The urinary function was comparable between the male subgroups on all severity levels (Table 5). Analysis of the mean IPSS score was also comparable (p = 0.060). However, the reported QoL related to urinary symptoms were significantly in favor of TaTME, where the vast majority reported they would be "*delighted*" to live the rest of their lives with their current urinary pattern (p = 0.010).

Discussion

Almost a decade after the introduction of TaTME and several thousand patients operated with this innovative method,[18,29] knowledge of the potential impacts on the quality of life, anorectal function, and urogenital function is limited. We have aimed to study these outcomes among a consecutive series of patients who underwent TME at our unit in the recent years. Generally, we found comparable results between TaTME and LaTME.

Table 2 EORTC QLQ-C30

	TaTME ($n = 49$)	LaTME ($n = 36$)	p value
Global health status*	77.72	79.86	0.625
Functional scales**			
Physical functioning	88.29	89.81	0.688
Role functioning	84.69	85.18	0.772
Emotional functioning	87.07	93.51	0.041
Cognitive functioning	90.47	95.83	0.069
Social functioning	88.43	93.51	0.272
Symptom scales*			
Fatigue	48.63	44.44	0.392
Nausea and vomiting	2.04	1.38	0.978
Pain	10.20	8.79	0.645
Dyspnea	12.24	4.62	0.063
Insomnia	18.36	14.81	0.449
Appetite loss	10.88	2.77	0.052
Constipation	10.88	6.48	0.549
Diarrhea	17.68	4.62	0.009
Financial difficulties	1.36	0 ± 0	0.223

Scale score range 0–100. Numbers are expressed in means

EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core

*Higher score indicates worse health-related quality of life

**Higher score indicates better health-related quality of life

Table 3 EORTC QLQ-C29

	TaTME Mean (n)	LaTME Mean (n)	p value
Functional scales*			
Body image	89.34 (49)	88.58 (36)	0.647
Anxiety	79.59 (49)	81.48 (36)	0.954
Weight	84.35 (49)	86.11 (36)	0.605
Sexual interest (men)	50.45 (37)	50.0 (20)	0.959
Sexual interest (women)	5.55 (12)	20.83 (16)	0.053
Symptom scales**			
Urinary frequency	11.90 (49)	19.44 (36)	0.516
Blood and mucus in stool	4.76 (49)	0.92 (36)	0.183
Stool frequency	19.79 (49)	17.12 (36)	0.440
Urinary incontinence	2.04 (49)	3.70 (36)	0.674
Dysuria	2.04 (49)	1.85 (36)	0.771
Abdominal pain	8.16 (49)	11.11 (36)	0.329
Buttock pain	14.28 (49)	2.77 (36)	0.011
Bloating	17.68 (49)	12.96 (36)	0.362
Dry mouth	18.36 (49)	10.18 (36)	0.387
Hair loss	2.72 (49)	1.85 (36)	0.896
Taste	4.16 (49)	0 (36)	0.047
Flatulence	32.65 (49)	26.85(36)	0.392
Fecal incontinence	20.40 (49)	13.88 (36)	0.133
Sore skin	14.96 (49)	7.40 (36)	0.128
Embarrassment	10.20 (49)	8.33 (36)	0.318
Impotence	50.45 (37)	48.33 (20)	0.767
Dyspareunia	0 (12)	2.08 (16)	0.802

Scale score range 0–100. Numbers are expressed in mean

EORTC QLQ-C29, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core

*Higher score indicates better health-related quality of life

**Higher score indicates worse health-related quality of life

The overall patient characteristics, quality of life, and global health status were comparable between patients who underwent laparoscopic or transanal TME. Most isolated results in the general QoL-related questionnaire EORTC QLQ-C30 and the complimentary module EORTC QLQ-CR29 designed specifically for colorectal cancer patients were comparable between the groups with few exceptions.

We have shown anorectal symptoms in disfavor of TaTME including buttock pain, diarrhea, clustering of stools, and urgency yet failed to show a significantly increased overall LARS score in TaTME patients.

When interpreting the differences, one must keep in mind that the mean follow-up differs significantly in the two groups, since the TaTME has been adopted and applied consecutively for all patients undergoing TME. Thus, our data must be interpreted with caution. The shorter follow-up period could possibly explain some of the significant results in disfavor of TaTME correlating, e.g., the worse emotional scale outcomes in the TaTME group. The same assumption can be made about worse results in the single symptoms diarrhea and buttock pain. LARS symptoms can however be present several years after surgery.[19] However, buttock pain could also be a symptom of the transanal approach itself or the ultralow anastomoses that are now feasible since the introduction of TaTME.

LARS is known from previous studies to be present in a significant percentage of TME patients, whether operated transanally or laparoscopically.[28,29] This outcome has gained interest in the recent years among colorectal surgeons although its impact and extent seem to be underestimated among colorectal surgeons.[20] An inventory from 2014 of TME patients operated in the Netherlands showed that 46% suffer from major LARS.[19] Emmertsen et al. have showed that bowel dysfunction is a major problem after TME, with a significant impact on the quality of life.[21] It is furthermore likely that patients focus more on anorectal symptoms after this type of surgery and a cancer diagnosis than they did before. Therefore, it could be of value to have patients fill out the same questionnaires prior to surgery.

Perioperative damage to the anal sphincter seems unlikely to be increased with the transanal approach since incontinence for flatus and stools is comparable regardless of technique. This assumption should however be proven and quantified in a prospective study assessing sphincter function with manometry pre- and postoperatively. Biviano et al.[22] have

Table 4 LARS

	TaTME ($n = 49$)	LaTME ($n = 36$)	p value
Incontinence for flatus			0.404
Never	18	16	
Once a week	9	3	
≧ Once a week	22	17	
Incontinence for liquid stools			0.149
Never	25	24	
< Once a week	20	8	
≧ Once a week	4	4	
Bowel frequency			0.764
1–3 times a day	24	21	
4–7 times a day	9	7	
> 7 times a day	4	4	
< Once a day	8	4	
Clustering of stools			0.017
Never	7	15	
< Once a week	11	6	
≧ Once a week	31	15	
Urgency			0.032
Never	12	15	
< Once a week	21	6	
≧ Once a week	16	15	
LARS categories			0.589
No (n)	17	16	
Minor (n)	15	8	
Major (n)	17	12	
Total LARS score, mean (± SD)	26.18 (10.32)	20.61 (14.51)	0.054

Scores 0–20 (no LARS), scores 21–29 (minor LARS), scores 30–42 (major LARS)

LARS, low anterior resection syndrome

studied the anorectal function in 27 patients after transanal endoscopic microsurgery (TEM) and found no evidence of long-term negative impacts on anal function.

At this moment, the published data on the functional outcomes after TaTME are limited. Kneist et al.[23] suggested that TaTME can potentially improve the functional outcomes. Koedam et al.[24] concluded that patient-reported quality of life is acceptable after TaTME, considering the issues represent a significant challenge in the management of rectal cancer regardless of the approach used. Veltcamp et al.[25] have made a direct comparison between the TaTME and LaTME groups from one institution and found outcomes comparable. Their study has a similar design to ours, with a smaller sample size. Our study shows comparable results of bowel function–related quality of life outcomes to the published series after TaTME, as well as LaTME and open TME.[26]

The rate of preoperative chemoradiation was low in both groups in this study and with no differences. Radiotherapy is a well-known risk factor for quality of life impairment due to deterioration in bowel function.[21,30]

Analyzing the IPSS questionnaire, we found no differences in symptoms concerning urinary function, except an overall higher satisfaction with urinary status in the transanal group. We also did not find any significant difference between the groups in sexual function. We did not assess urogenital function preoperatively; hence, we cannot comment on the impact either procedure had on the sacral nerves as patients could suffer from age-related symptoms. However, a study by Pontallier et al.[31] suggests that the TaTME allows better preservation of the pelvic nerves by showing better erectile function with a higher rate of sexual activity in the transanal group compared to laparoscopy. They showed that among sexually active patients with low rectal cancer (< 6 cm from the anal verge), 71% in the TaTME group vs 39% in the LaTME group maintained sexual activity after surgery.

Although our database is prospectively maintained, the data used in this study were collected only postoperatively, and we do not have data on these functional parameters prior to surgery, which also impairs the study design. As a natural consequence of TaTME being a relatively new procedure, the size of the study population is limited. Future prospective multicenter studies may overcome this limitation.

Our study also has limitations including the linear design, where the scales are unweighted and summated, assuming that

Table 5 IPSS

	TaTME (37)	LaTME (20)	*p* value
IPPS score			0.236
No symptoms (*n*)	6	1	
Mild (*n*)	17	9	
Moderate (*n*)	12	8	
Severe (*n*)	2	2	
Mean IPSS (± SD)	6.73 (± 7.419)	10.05 (8.153)	0.060
Urinary symptom–related QoL			0.010
Delighted (*n*)	22	8	
Pleased (*n*)	7	7	
Mostly satisfied (*n*)	7	0	
Mixed (*n*)	0	3	
Mostly dissatisfied (*n*)	0	1	
Unhappy (*n*)	1	0	
Terrible (*n*)	0	1	

Scores 0–7 (mild), scores 8–19 (moderate), scores 20–35 (severe)

IPSS, International Prostate Syndrome Score

it is appropriate to weigh each item equally. However, Cox et al.[32] proposed "simple integer scoring is likely to be enough for many purposes." Another limitation of the questionnaire study design is that differences between groups may be difficult to interpret, as a statistical significant difference does not necessarily imply any clinical importance.

Almost all our TaTME-patients were operated by a single surgeon (the last author of this article), and the learning curve may have influenced the published results in disfavor of TaTME when compared to LaTME, the latter performed by surgeons already with sufficient expertise in the procedure and a tendency towards lower anastomosis in the beginning of the implementation of TaTME.

We do in our department not have preoperatively collected functional data which represents a weakness in the study design. A properly designed questionnaire study that involves preoperative assessment through—among other things—anorectal manometry is warranted and could overcome some of the limitations of our study and give an improved picture of the functional results after TaTME. One such study is currently underway from our unit.

Conclusion

We find that anorectal dysfunction may occur after TME, regardless of surgical technique (transanal or laparoscopic), and the overall quality of life is comparable between the groups. LaTME was shown favorable in single anorectal outcomes, yet overall LARS score was comparable. TaTME resulted in favorable QoL-related urinary function outcomes in male patients. Our results are comparable to published literature.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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