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Quality of Life and Functional Outcome After Transanal Abdominal Transanal Proctectomy for Low Rectal Cancer

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Abstract

BACKGROUND—Transanal abdominal transanal proctectomy is a sphincter-preserving procedure designed to avoid colostomy in patients with cancer in the distal third of the rectum. Oncologic outcomes of this procedure have been established. However, data regarding patient satisfaction and quality of life are scant.

OBJECTIVE—The purpose of this study was to evaluate the quality of life and functional outcomes of patients after transanal abdominal transanal proctectomy.

DESIGN—This is a cross-sectional study.

SETTINGS—The study was conducted at a tertiary referral colorectal center.

PATIENTS—Patients who underwent transanal abdominal transanal proctectomy were included and surveyed using the Fecal Incontinence Quality of Life Scale, the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30, the Quality of Life Questionnaire CR38 module, and a questionnaire designed by the authors to assess satisfaction with quality of life.

MAIN OUTCOME MEASURES—Quality of life, functional outcomes, and patient satisfaction were measured and compared by age, tumor level, and stage of the disease.

RESULTS—A total of 133 surveys were mailed, and 90 patients responded and were included in the study. Patient quality of life was not significantly different after surgery. Patients with more proximal tumors had better lifestyle, physical, and emotional scores. Older patients performed better on multiple levels, including coping, emotional, body image, future perspective, and digestive. Stage of disease had no impact on quality of life. Compared with reference values, patients who underwent transanal abdominal transanal proctectomy performed better on most of the components. All of patients preferred transanal abdominal transanal proctectomy over having a stoma based on their current anal sphincter function, and >97% of patients preferred transanal abdominal transanal proctectomy based on their current quality of life, sexual function, and level of activities.

LIMITATIONS—This study is limited by the lack of a comparison group and a potential selection bias.

CONCLUSIONS—Satisfaction with quality of life and functional outcomes is high after transanal abdominal transanal proctectomy. Older patients and those with more proximal tumors performed better. This patient population clearly preferred a sphincter-preserving option for treatment of their rectal cancer.

Keywords

Colo-anal anastomosis; Quality of life; Rectal cancer; Sphincter-preserving surgery; Total mesorectal excision; Transanal abdominal transanal; Transanal total mesorectal excision

Surgical resection represents the mainstay treatment of rectal cancer. However, for patients with low rectal cancer, this usually entails removing the anal sphincter and committing the patient to a permanent colostomy to effect a cure. Although abdominoperineal resection (APR) offers the chance for cure, it is correlated with a worse quality of life (QoL) and an increased prevalence of depression because of the permanent colostomy.¹ In fact, studies suggest that patients with a stoma have a poorer QoL than those without a stoma, and, although many patients accept a colostomy without issue, many patients consider life with a permanent colostomy to be unacceptable.^{2,3}

The desire to simultaneously cure the rectal cancer and avoid a permanent colostomy led to the development of the transanal abdominal transanal (TATA) proctosigmoidectomy, a sphincter-preserving surgery, first described by Marks et al in 1988.⁴ This development ushered in at patient insistence with the assumption that QoL would be improved by avoidance of a permanent stoma.

Although this approach has been well described, for a variety of reasons its adoption in the surgical community has been limited. A major concern voiced has been concerns over the QoL of patients in terms of continence and functional status. Indeed, a common refrain from many surgeons reluctant to the approach of expanded sphincter preservation has been either, “The patient would be better off with a colostomy,” or “Why give the patient a perineal colostomy?”

However, our impression of patient QoL after the TATA has been very positive. Although our oncologic outcomes with this operation have been favorable and published previously,^{5,6} we have not reported on QoL. In the literature, QoL is poorly assessed in studies, and its importance is underestimated by physicians.⁷ To decide on the proper operation for their patient, surgeons want to know what kind of QoL a patient should expect.

The purpose of this study was to evaluate the QoL and functional outcomes of patients with cancers in the distal third of the rectum who avoided a permanent colostomy by using neoadjuvant therapy and a TATA procedure. Additional analysis was performed to determine the effect of patient age, level in the rectum, and stage of the cancer on QoL.

PATIENTS AND METHODS

From an institutional review board–approved, prospectively maintained rectal cancer database, we identified 279 consecutive patients who underwent a TATA between November 1985 and February 2008.

The hallmark of the TATA is starting the operation transanally by performing a full-thickness circumferential incision at the dentate line. Intersphincteric dissection is then carried out transanally in the intersphincteric plane between the puborectalis and the upper portion of the internal sphincter, sparing the lower portion of the internal sphincter and the external sphincter entirely. The rectum is mobilized transanally to the level of cervix in women and seminal vesicles in men. This allows for a known distal margin and the performance of the most difficult portion of the total mesorectal excision (TME) dissection, the distal part, to be performed first. This differs from an intersphincteric proctectomy, where the TME dissection is initiated abdominally and taken down as low as possible and then the operation is finished transanally. The fundamental aspect of the TATA and all other forms of the transanal TME as it is evolving around the world, is the initiation and continuation of the TME dissection transanally and extended cephalad to encompass the distal third to half of the rectum. The majority of patients had a straight coloanal anastomosis, because colonic J-pouches and side-to-end anastomosis were not adopted in our unit until after 2010.

Attempts were made to contact all of the patients. Of the 279 patients, 106 had died (38%), and 40 questionnaires (23%) did not reach patients because their addresses were untrackable. A total of 133 patients received the questionnaire by mail. Of these patients, 90 (67.7%) responded to the questionnaire and formed the basis of this study.

To evaluate patient QoL, 4 questionnaires were used. These included 3 validated tools, the Fecal Incontinence Quality of Life Scale (FIQLS), the European Organization for Treatment and Research of Cancer (EORTC) Quality of Life Questionnaire (QLQ)-C30, the EORTC QLQ-CR38, and a metric regarding QoL and attitude toward colostomy that we developed. QoL results were evaluated as an overall group and subsequently compared by patient age (<75 vs ≥75 y), both at the time of surgery and at the time of answering the questionnaire, tumor level in the rectum relative to the anorectal ring (<1 vs ≥1 cm), and stage of disease on presentation (stage 1 or 2 vs stage 3).

The first instrument was the FIQLS (Wexner scale) questionnaire, a list of 29 questions grouped together to test lifestyle, coping, depression, and embarrassment secondary to stool incontinence. A higher score represents better function, with a maximum score of 4.

The second instrument was the EORTC QLQ, an integrated system for evaluating QoL of patients with cancer. The core questionnaire, the EORTC QLQ-C30, is a generic cancer QoL instrument that consists of 30 questions and has both multi-item scales and single-item measures.⁸ It includes 5 functional scales, 3 symptom scales, a 6 single-item measure, and a global QoL 2-item measure.

The third instrument was the QLQ-CR38, a disease-specific QoL instrument designed specifically to evaluate QoL of patients with colorectal cancer.⁹ It consists of 38 questions and has both multi-item scales and single-item measures. It includes 2 functional scales, 7 symptom scales, and 3 single-item measures. Each item has 4 responses scaled from “not at all” to “very much,” except for the global health and QoL scales, which have 7 alternatives from “very poor” to “excellent.”

The scores are summed and converted into the 0 to 100 scale according to the EORTC scoring manual. The results are then interpreted as follows: the higher the score in the global QoL scale and the functional scales, the better the QoL is. The higher the score in the symptoms scales, the worse is the assessed symptom, meaning worse QoL.

The last instrument was designed by the authors to directly assess patient satisfaction with their QoL. It was first used to assess QoL after transanal endoscopic microsurgery.¹⁰ In the first 2 questions, the patients were asked to assess their overall satisfaction with their life-style before and after the procedure. The scale ranged from 1 (poor) to 7 (excellent). The remaining 4 questions asked whether a patient would prefer having a permanent stoma rather than a TATA because of continence, sexual function, level of activity, or overall QoL. These preferences scaled from “not at all,” “a little,” “quite a bit,” to “very much.”

The patients scores from the QLQ-C30 questionnaire were compared with reference values provided by the EORTC QoL group.¹¹ This provides a comparison of patients with similar characteristics with the patients treated with a TATA. This is recognized as imperfect but provides the readership some comparison that can palliate to the lack of a control group. The unpaired *t* test was used to compare the score of the questionnaires in these groups, and a *p* value <0.05 was considered to be statistically significant.

RESULTS

A total of 106 (38%) had died between 1985 and 2008; 68 patients (64.2%) died from rectal cancer. Ninety patients, 60 men (66.7%) and 30 women, responded to the questionnaires. All respondents completed all of the questionnaires. Mean age was 73 years (range, 50–93 y). The median follow-up time after surgery was 104.3 months (range, 6.2–300.2 mo). A total of 95.6% of patients had a follow-up period of >24 months (Table 1).

Mean pretreatment tumor size was 4.8 cm (range, 1.5–12.0 cm), and mean level from the anorectal ring was 1.6 cm (range, –1.0 to +6.0 cm). All of the patients received neoadjuvant radiotherapy, at a mean dose of 5465 cGy (range, 3000–8500 cGy).

Mean age at the time of surgery was 59.2 years (range, 39.0–83.0 years), with 80 patients (88.9%) <75 years old. Procedures were performed in an open fashion in 36 patients (40%) and laparoscopically in 54 patients (60%). Complications were observed in 15 patients (16.7%), including 3 urinary retentions, 2 atrial fibrillations, 2 anastomotic leaks, 2 small-bowel obstructions, 1 wound infection, 1 ileus, 1 stomal prolapse, 1 stoma site hernia, 1 hernia, and 1 rectal prolapse.

FIQLS (Wexner Scale) Questionnaire

The overall scores for the 4 components of the FIQLS questionnaire and the subset scores divided on the basis of age at the time of the study, age at the time of the surgery, level of cancer, and stage of the disease are listed in Table 2. The overall score reported for the effect of stool incontinence was the lowest for the coping component (2.59) compared with embarrassment (2.76), lifestyle (3.1), and depression (3.47).

Subgroup analysis revealed that older patients coped better than younger ones based on the age at the time of surgery (2.88 vs 2.58) and age at the time of the study (2.76 vs 2.49). Depression, lifestyle, and embarrassment scores did not differ significantly between age groups.

Lower level of the cancer in the rectum (<1 vs 1 cm) was associated with lower scores on all of the metrics but only reached statistical significance on lifestyle with a score of 2.83 for patients with a tumor within 1 cm compared with a score of 3.18 for those with more proximal lesions (>1 cm; $p < 0.0001$). Stage of the disease on presentation did not significantly impact the 4 different components.

EORTC QLQ-C30 Questionnaire and CR38 Module

Tables 3 and 4 summarize the overall scores for QoL functions, and problems included in EORTC QLQ-C30 and Tables 5 and 6 show QoL data based on the CR38 module. In the “functional” part, the average score for the global QoL experienced by the patients who underwent TATA was 79.17. The highest functional component was physical (90.31) and the lowest was sexual enjoyment (47.41).

The highest score in the problems section of the questionnaire were those for sexual (56.83), diarrhea (29.96), defecation (27.26), fatigue (18.02), and insomnia (17.98). The scores for problems range between 0 and 100, with higher scores representing worse problems.

In subgroup analysis, older patients at the time of the study had better emotional scores (86.97) than younger patients (81.79; $p = 0.02$). They had also better body image ($p = 0.0023$), sexual function ($p = 0.0002$), and future perspective ($p = 0.0146$) than those who were younger. The 2 age groups did not differ in the symptoms components.

Patients who underwent surgery at an older age (>75 y) had better body image than those who were younger ($p = 0.0347$). They also had less digestive problems ($p = 0.0217$) but more weight loss ($p = 0.0203$).

A comparison of proximal lesions and more distal ones showed that patients with more proximal tumors (<1 cm from anorectal ring) had significantly better physical and emotional scores than those with more distal tumors. However, there was no significant difference in terms of symptoms between the 2 groups.

In comparing early stages of the disease (less than stage 3) with more advanced disease (stage 3 or more), we found that patients with early stages had more constipation ($p = 0.0179$) and more micturition problems ($p = 0.0301$). There was no difference in the functional part.

We also compared our values from the QLQ-C30 questionnaire with reference values as explained in the Patients and Methods section. After TATA, surgery patients had better scores compared with baseline (pretreatment) reference values of patients for physical, role, emotional, and QoL assessment. In addition, patients who underwent TATA had better results regarding their assessment of fatigue, nausea/vomiting, pain, dyspnea, insomnia, and appetite loss than reference patients. However, they did have more problems with diarrhea (Table 7).

Patient Satisfaction Evaluation: Marks Metric for Effect of Continence on QoL

Our data regarding QoL judgment is shown in Figures 1 and 2. A total of 79% of patients judged their QoL to be good to excellent after surgery compared with 88% before the operation ($p = 0.11$).

Results regarding patient preference for a colostomy versus their current level of function after a TATA are shown in Table 8. Asked if they would prefer a colostomy based on their current QoL, 98.7% responded a little to not at all; based on sexual function, 98.7% of the patients responded a little to not at all; regarding activity, 97.4% said a little to not at all; and regarding fecal continence based on their current level of control, 100% responded that they would prefer a colostomy not at all to a little.

DISCUSSION

The TATA procedure, developed by Marks et al,⁴ is a sphincter-preserving surgery designed for low rectal cancer. It has the advantages of allowing a known distal margin, avoiding work in a deep pelvis, and preserving the anal sphincter sparing the patient from a permanent colostomy. It has subsequently been referred to in publications from other centers as an intersphincteric proctectomy. Although the TATA is a subgroup of an intersphincteric resection (ISR), the key difference is that, in the former, the dissection is initiated transanally, whereas, in the latter, a standard top-down TME is performed with completion of the dissection transanally. The technique developed out of a desire to extend sphincter preservation establishing a known distal margin in patients with low rectal cancers who had been downstaged from high-dose preoperative radiotherapy to an impalpable scar.

From an oncologic standpoint, TATA is a safe procedure. We published our laparoscopic TATA experience with the aim of looking at short-term and long-term results. The local recurrence rate was 2.5%, and the distant metastasis rate was 10.1%. The overall 5-year survival rate was 97%, which compares favorably with the literature.⁵ These long-term data support the oncologic basis for the intersphincteric dissection performed during the TATA procedure.

After establishing the effectiveness and safety of TATA procedure, the main concern remains the QoL. Very few studies have addressed QoL and functional status of patients after ISR in general and even less after TATA specifically. Bittorf et al¹² reported results of functional outcome of 33 patients treated with ISR and coloanal anastomosis. A total of 25.8% of the patients were incontinent to solid stool, and 54.8% were incontinent to liquid stool at least once a week. Other studies reported good continence rates of 57% to 72% after ISR.^{13,14}

This study was designed to investigate the outcomes of patients who underwent TATA in terms of QoL and functional outcomes. It is one of the largest in the literature with 90 patients included, and it adds significantly to the understanding of QoL of patients in the United States after ISR and TATA.

In the FIQLS questionnaire, patients scored the lowest on the coping and embarrassment components. This is likely because of their concern regarding the fear of actual minor incontinence. However, our results compare favorably with those published in the literature.¹⁵ Bretagnol et al¹⁵ reported FIQLS results of 40 patients who underwent ISR. Our patients scored higher in all 4 components, including lifestyle (3.10 vs 2.80), coping (2.59 vs 2.40), depression (3.47 vs 3.20), and embarrassment (2.76 vs 2.30). In our study, patients scored best in the lifestyle component (3.10), and this resulted largely from their satisfaction with their continence and the opportunity to live without a permanent stoma. Patients who had more proximal tumors had better lifestyle. This is as expected and correlated with the amount of internal sphincter that was preserved.

Konanz et al¹⁶ compared the QoL of patients after low anterior resection, ISR, and APR using the EORTC QLQ-C30, CR38, and the Wexner score. They found that global QoL was comparable between the groups. However, physical and sexual functions were significantly better after ISR compared with APR, but diarrhea and constipation were higher after ISR. These data are in accordance with our results where patients scored best at physical functioning (90.31) and worse at diarrhea (29.96) and constipation (11.61). Constipation after sphincter-preserving surgery may possibly be explained based on an evacuation disorder attributed to loss of the sensitive region at the anorectal junction with consecutive loss of coordination in the defecatory process.

Comparing our results with those published in the literature for APR using the standardized EORTC QLQ-C30, patients who underwent TATA scored better in all of the functional scales,^{16,17,18} including general QoL (79.2 vs 54.5), physical (90.3 vs 70.6), roles (87.9 vs 71), emotional (83.9 vs 61.8), cognitive (87.9 vs 75.6), and social (78 vs 65).¹⁸ They also performed better in the QLQ-CR38 module.^{16,18}

An unexpected finding of this study is that older patients performed better emotionally and had better body image and future perspectives compared with younger patients. This is perhaps related to the fact that older patients coped better than younger ones. Surprisingly, older patients also reported better digestive and sexual functioning compared with younger patients (78.9 vs 62.5). This might be explained by the fact that they might have more realistic expectations than younger patients so that the surgery did not psychologically affect them as much as it did younger patients. As expected, patients with more proximal lesions had better emotional and physical functioning.

All of these studies addressed the issues of QoL and functional outcomes based on established scales. However, none of them clearly asked the patients if they were satisfied with their surgery or whether they would prefer a permanent colostomy. To address this issue, we tried to measure patient level of satisfaction with the current form of treatment to get a patient-oriented outcome. Therefore, we asked them if they would have preferred

having a colostomy rather than TATA. More than 90% of the patients responded that they never would have preferred to have a colostomy. This measurement reflects that patients had a high level of subjective satisfaction with their treatment. We believe that this form of questionnaire gives a clear idea about the QoL and level of satisfaction of patients after TATA, especially those patients who would otherwise have had an APR. Most tellingly perhaps is that 100% of respondents preferred their current level of function over a permanent colostomy. Possible reasons for this are many.

Although it is clear that patients after a TATA will never have the same bowel function that they enjoyed before developing rectal cancer, these data strongly support that they develop a new normal, which, although not perfect, is one that they are very pleased with. Compared with life with a colostomy, in their mind they uniformly preferred their current situation.

These findings provide hard data for the impressions gained from caring for these TATA patients over a long period of time, namely that, not surprisingly, the higher the cancer, the better the function and QoL for the patient. Also, that function continues to improve and patients to adapt over a long period of time. Indeed, 1 possible explanation for these strongly positive findings is the long median follow-up of >8 years in this group, and that >95% of patients had >2 years of follow-up. Contrary to our clinical impressions, younger patients did not report better function than an older cohort. Whether this is a result of actual function versus satisfaction and expectations is outside the scope of this study.

This study contributes to the understanding of patient life after treatment with sphincter preservations in a low rectal cancer, and experiences of a multitude of shortcomings. Prospective data accrual with measurement of these QoL and functional metrics longitudinally during the course of their treatment and recovery is valuable. So is the comparison with patients who had undergone an APR as a comparative group. However, in our unit, this remains a very low number that is not fairly suited for comparison. The number of patients included in this study represents one of the largest cohorts studying QoL. However, 32.3% of patients did not respond, and this represents a limitation: patients with poor functional outcomes may be less likely to have responded and thus may not be included in the study. Although 3 of the questionnaires used in this study have been validated and are widely used in the literature, the metrics of Marks et al⁴ lacks validation. However, for every validated tool, there must be an initial experience. This metric has been used previously for patients who underwent transanal endoscopic microsurgery and was published in 2014.¹⁰ This is the initial use in patients who underwent TATA and, although we believe the information was useful, this tool will need validation for future use. The Low Anterior Resection Syndrome Score is another very useful tool that we may adopt moving forward. However, this tool was not yet published at the time that this study was designed, and thus it was not used. Another limitation is the potential bias because of the use of retrospectively collected data and the use of generic reference values from the EORTC QoL group. Although imperfect, we believe that it gives some reference to help overcome the lack of a control group. More importantly, because of patient referral, there is significant patient self-selection. A large number of these patients came to be treated by us specifically because they refused to accept a permanent colostomy. This patient selection effect on the QoL and

their satisfaction with the outcome can not be overstated, because this is clearly a very motivated population of patients with rectal cancer.

CONCLUSION

We demonstrate that patients with rectal cancer in the distal third of the rectum who avoid a permanent colostomy and undergo a TATA are pleased with their QoL. They clearly preferred this approach before surgery, and our data support that they continued to be pleased with their QoL after the operation. Patients who underwent TATA had better QoL compared with those who had an APR using the standardized questionnaires. This study also identifies a subgroup of patients who perform better than others in terms of QoL: older patients (>75 y) and those with more proximal tumors (>1 cm from the anorectal ring) performed better on multiple levels. This experience represents a very motivated patient population and may not extrapolate to all patients with rectal cancer. However, these data on QoL, combined with our previous published oncologic data,⁵ must give pause to the surgeon who is unilaterally deciding that a patient would be “better off” with an APR. For motivated patients expressing the desire to avoid a colostomy, this study strongly supports discussion of a TATA as an alternative option.

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FIGURE 1.
Distribution of general quality-of-life score before and after the operation assessed by a questionnaire designed by the authors.

FIGURE 2.

Comparison of general quality-of-life for patients who score $>$ or $\leq$ 4 before and after the operation assessed by a questionnaire designed by the authors.

TABLE 1

Patient demographics and characteristics

Variable	Responders
Sex, n	
Men	60
Women	30
Mean age at surgery (range), y	59.2 (39.0–83.0)
Mean age at study (range), y	73.0 (50.0–93.0)
Median follow-up (range), mo	104.3 (6.2–300.2)
Patients with >24 mo of follow-up, n (%)	86 (95.6)
Mean tumor size (range), cm	4.8 (1.5–12.0)
Level in the rectum (range), cm ^a	1.6 (–1.0 to +6.0)
Mean dose of radiation, cGy	5465

^aData show the distance from the anorectal ring; negative value = distal to it; positive value = proximal to it.

TABLE 2

FIQLS (Wexner) score of patients after TATA

Variable	Lifestyle	Coping	Depression	Embarrassment
Overall	3.10	2.59	3.47	2.76
Age at OR <75 y	3.08	2.58	3.49	2.76
Age at OR 75 y	3.20	2.88	3.23	2.70
<i>p</i>	0.3296	0.0264	0.1447	0.793
Age now <75 y	3.03	2.49	3.39	2.71
Age now 75 y	3.18	2.76	3.58	2.80
<i>p</i>	0.0629	0.0023	0.0932	0.5115
Distance <1 cm ^a	2.83	2.52	3.39	2.58
Distance 1 cm ^a	3.18	2.62	3.52	2.81
<i>p</i>	<0.0001	0.3011	0.3539	0.136
Stage <3	3.09	2.63	3.52	2.75
Stage 3	3.05	2.53	3.44	2.69
<i>p</i>	0.6111	0.2842	0.5194	0.713

FIQLS = Fecal Incontinence Quality of Life Scale; TATA = transanal abdominal transanal; OR = operation.

^aData include the distance from the anorectal ring.

TABLE 3

Functional scores on the EORTC QLQ-C30

Data	Physical	Role	Emotional	Cognitive	Social	QoL
Overall	90.31	87.96	83.90	87.89	78.03	79.17
Age at OR <75 y	90.56	88.61	83.65	87.69	77.07	78.80
Age at OR 75 y	88.67	81.67	87.96	91.67	83.33	81.67
<i>p</i>	0.5756	0.1552	0.2384	0.3495	0.2983	0.4198
Age now <75 y	90.90	89.46	81.79	86.60	74.91	79.93
Age now 75 y	89.67	85.83	86.97	90.00	81.25	78.13
<i>p</i>	0.564	0.2431	0.0201	0.2084	0.0973	0.4953
Distance <1 cm ^a	86.38	92.75	79.49	86.96	78.26	77.90
Distance 1 cm ^a	92.31	86.67	85.80	88.01	77.27	80.00
<i>p</i>	0.014	0.0872	0.0173	0.725	0.8198	0.4999
Stage <3	92.40	85.51	86.45	86.23	76.09	78.62
Stage 3	89.84	88.99	82.42	88.12	78.27	79.02
<i>p</i>	0.2897	0.3299	0.1286	0.5543	0.6161	0.8979

EORTC QLQ-C30= European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; QoL = quality of life; OR = operation.

^aData include the distance from the anorectal ring.

TABLE 4

Symptom scores on the EORTC QLQ-C30

Variable	Fatigue	N/V	Pain	Dyspnea	Insomnia	Apt loss	Constp	Diarrhea	FD
Overall	18.02	2.62	10.99	9.26	17.98	4.87	11.61	29.96	11.48
Age at OR <75 y	17.58	2.95	10.99	8.44	19.23	5.06	11.81	32.05	12.66
Age at OR 75 y	21.11	0	16.67	16.67	10.00	3.33	10.00	16.67	3.33
<i>p</i>	0.4136	0.199	0.2824	0.1938	0.2476	0.7279	0.7903	0.0847	0.2195
Age now <75y	16.55	2.72	8.25	6.80	14.97	5.44	10.20	28.57	15.65
Age now 75 y	19.72	2.50	14.58	12.50	22.22	4.17	13.33	32.48	6.67
<i>p</i>	0.2474	0.8799	0.0509	0.156	0.154	0.6862	0.4696	0.4963	0.061
Distance <1 cm ^a	21.74	2.90	9.63	15.94	21.74	5.80	13.04	36.23	14.49
Distance 1 cm ^a	16.27	2.38	11.31	7.14	18.18	2.98	10.71	26.67	10.71
<i>p</i>	0.0733	0.7598	0.6423	0.0661	0.5595	0.3866	0.6509	0.1357	0.5159
Stage <3	18.52	1.39	14.58	6.94	14.49	1.39	20.83	24.64	12.50
Stage 3	18.06	2.98	9.01	10.71	20.83	5.36	8.93	31.55	12.50
<i>p</i>	0.8777	0.3778	0.1123	0.426	0.2945	0.2268	0.0179	0.2887	1

EORTC QLQ-C30= European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; OR = operation; N/V = nausea/vomiting; Apt = appetite; Constp = constipation; FD = functional difference.

^aData include the distance from the anorectal ring.

TABLE 5

Functional scores on the EORTC QLQ module CR38

Variable	Body image	Sexual functioning	Sexual enjoyment	Future perspective
Overall	78.82	69.92	47.41	67.41
Age at OR <75 y	77.30	68.61	47.97	65.82
Age at OR 75 y	89.29	79.63	41.67	80.00
<i>p</i>	0.0347	0.1352	0.6986	0.1962
Age now <75y	73.79	62.50	42.53	59.86
Age now 75 y	84.46	78.95	56.25	76.67
<i>p</i>	0.0023	0.0002	0.1515	0.0146
Distance <1 cm ^a	80.68	73.48	40.74	65.22
Distance 1 cm ^a	79.27	68.83	48.39	69.64
<i>p</i>	0.7165	0.371	0.4939	0.5796
Stage <3	82.35	73.91	50.00	63.89
Stage 3	77.18	67.90	44.83	69.05
<i>p</i>	0.1976	0.2501	0.6358	0.5037

EORTC QLQ = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire.

^aData include the distance from the anorectal ring.

TABLE 6

Symptom scores on the EORTC QLQ module CR38

Variable	Micturition	Digestive	Defecation	Sexual	Weight loss
Overall	17.04	17.19	27.26	56.83	8.61
Age at OR <75 y	16.46	18.29	27.55	55.96	6.75
Age at OR 75 y	21.79	10.20	26.34	64.10	22.22
<i>p</i>	0.3186	0.0217	0.7559	0.4815	0.0203
Age now <75y	15.19	17.49	27.80	52.81	6.80
Age now 75 y	19.25	17.26	26.96	63.70	10.26
<i>p</i>	0.2068	0.9166	0.7335	0.1394	0.402
Distance <1 cm ^a	18.84	16.67	29.00	61.11	10.14
Distance 1 cm ^a	16.46	16.97	27.76	53.66	6.67
<i>p</i>	0.5146	0.9063	0.6579	0.4129	0.4538
Stage <3	22.22	20.17	30.56	54.02	10.14
Stage 3	14.43	16.61	27.01	57.81	7.14
<i>p</i>	0.0301	0.1637	0.2238	0.655	0.5193

EORTC QLQ = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire.

^aData include the distance from the anorectal ring.

TABLE 7

Comparison of scores on the EORTC QLQ-C30 with reference values

	Our study, mean (SD)	Reference, mean (SD)	p
Physical	90.31 (15.03)	79.2 (21.1)	<0.00001
Role	87.96 (19.84)	70.4 (32.8)	<0.00001
Emotional	83.9 (16.11)	68.9 (24.5)	<0.00001
Cognitive	87.89 (13.64)	85.2 (20.4)	0.079
Social	78.03 (21.47)	76 (28.6)	0.39
QoL	79.17 (16.54)	60.7 (23.4)	<0.00001
Fatigue	18.02 (18.81)	34.7 (28.4)	<0.00001
Nausea/vomiting	2.62 (7.49)	7.3 (17.2)	<0.00001
Pain	10.99 (19.7)	24 (29.6)	<0.00001
Dyspnea	9.26 (18.71)	17.4 (26.3)	0.0002
Insomnia	17.98 (24.08)	30.5 (32.6)	<0.00001
Appetite loss	4.87 (15.16)	19.1 (30.2)	<0.00001
Constipation	11.61 (20.6)	15.8 (27.9)	0.068
Diarrhea	29.96 (27.29)	16.6 (27.6)	<0.00001
Functional difference	11.48 (22.44)	13.6 (26.3)	0.39

EORTC QLQ = European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; QoL = quality of life.

TABLE 8

Summary of responses to the satisfaction questionnaire designed by the authors

	Not at all, %	A little, %	Quite a bit, %	Very much, %
Would you prefer to have a stoma based on your current level of activity?	91.03	6.41	2.56	0
Would you prefer to have a stoma based on your current control over defecation?	92.50	7.50	0	0
Would you prefer to have a stoma based on your current sexual problems?	97.30	1.35	0	1.35
Would you prefer to have a stoma based on your current quality of life?	90.91	7.79	1.30	0