

# Factors influencing sexual function in patients with rectal cancer

CE Schmidt<sup>1\*</sup>, B Bestmann<sup>2</sup>, T Kuchler<sup>2</sup> and B Kremer<sup>1</sup>

<sup>1</sup>Department of General and Thoracic Surgery, University Clinic of Schleswig-Holstein, Campus Kiel, Kiel, Germany; and

<sup>2</sup>Reference Center Quality of Life in Oncology, University Clinic of Schleswig-Holstein, Campus Kiel, Kiel, Germany

Only few studies have investigated the impact of surgery for rectal cancer on sexual function. Little of that research included quality of life (QoL) aspects and hardly any study analyzed the impact of age, gender and type of surgery on sexual function. The aim of the presented study was to address these issues. Over a 5 y period, EORTC-QLQ-C-30 and a tumor-specific module were prospectively administered to patients before surgery, at discharge, 3, 6, 12 and 24 months postoperatively. Comparisons were made between patients receiving abdominoperineal resection (APR), anterior resection (AR) with or without Pouch and Sigmoid resection. Furthermore, effects of surgery on female and male patients, and age groups were analyzed. A total of 819 patients participated in the study: 412 were males and 407 were females. The groups were comparable in terms of adjuvant treatment, tumor stage and histology. Patients after APR and AR with Pouch had worst sexual function. Men reported significantly more difficulties with sexual enjoyment; furthermore, over time, sexual problems created high levels of strain in men that were worse than baseline levels in the early postoperative period. These problems tended to remain. Patients aged 69 y and younger scored higher for problems with loss of sexual function and sexuality-related strain than patients aged 70 y and older. The findings in this study confirm that QoL changes postsurgery and that factors like type of surgery, gender and age have tremendous impact on sexual function and sexual enjoyment. APR and AR with Pouch affect sexual function more than AR and resection of the lower sigmoid. Through impaired sexual enjoyment, men are put more under strain than women. Patients aged 69 y and younger experience more stress through deteriorated sexual function.

*International Journal of Impotence Research* (2005) 17, 231–238. doi:10.1038/sj.ijir.3901276

Published online 17 February 2005

**Keywords:** rectal cancer; sexual function; gender; age; type of surgery; quality of life

## Introduction

Colorectal cancer is the second and third most common cancer among women and men in the United States and Europe.<sup>1</sup> Treatment includes rectal resection and radio/chemotherapy in 50% of all cases.<sup>2</sup> Standard for oncologic resection of lower cancers includes total mesorectal excision (TME).<sup>3</sup> This comprehensive treatment is known to cause sexual dysfunction. However, the incidence varies and depends on the surgical technique and extent of resection. Reported values range from 18 to 50%.<sup>2</sup> A

reason for variation lies in the assessment of sexual function, which has been inconsistent in most studies. The techniques differ greatly and include interviews, clinical tests and nonvalidated questionnaires.<sup>4,5</sup> Furthermore, factors such as age, gender adjuvant therapy and type of surgery can also have an impact on sexual function, but studies measuring this effect in a prospective way are rare. Finally, it is important to consider patients' quality of life (QoL) to determine whether such impairments disrupt everyday activities. Some studies have included QoL, but the instruments used were often not tumor specific or not validated, which has caused inconsistent findings.<sup>6</sup>

This study describes a 5-y prospective assessment of sexual function and QoL in patients with rectal cancer and cancer of the lower sigmoid (16–22 cm from anus). The aim was to determine to what extent sexual function was influenced by surgery, gender and age. Therefore, main focus will be put on sexual function and less on clinical and general QoL data.

\*Correspondence: C Schmidt, Surgery, University of Kiel, Arnold-Heller-Str 7, Kiel, Germany.

E-mail: c.schmidt-7.0@t-online.de

Received 5 February 2004; revised 21 September 2004; accepted 24 September 2004

## Patients and methods

A prospective evaluation of 819 patients with rectal cancer including patients with cancer of the recto-sigmoid border (16–20 cm from anus), who had undergone resection in our department from January 1997 to December 2002, was undertaken. A total of 39 patients who underwent an anterior rectal resection for gynecological tumors or benign lesions, two patients with psychiatric disorders and patients with existing sexual malfunction were excluded from the study. Questions on preoperative sexual dysfunction were asked on admission. Informed consent to analyze patient data was obtained from patients prior to surgery in our department.

All patients received a questionnaire requesting information regarding demographic factors and the impact of cancer on QoL. The questionnaires were distributed before surgery and at discharge. In 95% of cases, this was within 12 days ( $\pm 3$  days) following surgery. Postoperatively, to determine survival status, the patients' physicians were contacted prior to mailing the questionnaires, and when applicable, cause of death. At 3, 6, 12 and 24 months following surgery, the questionnaires were mailed to the patients. Details of medical and drug history, histology, stage of disease and therapy given were collected from the patient's records.

General cancer-related QoL was measured with EORTC-QLQ-C-30.<sup>7</sup> In this questionnaire, QoL is assessed on seven dimensions: functional status, role function, general symptoms, cognitive, emotional, social functioning and financial strain. In addition to the general questionnaire, we used a tumor-specific module that was developed according to the guidelines of EORTC.<sup>8</sup> The English version of the instrument is validated and the German validation is in process. Reliability was determined by a Cronbach's  $\alpha$  of 0.762.<sup>9</sup> The module also showed a good face validity. We added questions about sexual function, sexual strain and use of aids for colostomy and fecal incontinence.<sup>9</sup> The questions were only included in the modules at 3, 6, 12 and 24 months after surgery. They asked about impairment of sexual function related to surgery and about stress/strain from this impaired sexual function. Furthermore, the patients are asked about the extent to which the medical treatment has put them under strain. Both questionnaires contain questions related to the previous week. Four response categories from 1 (not at all) to 4 (very much) are possible. The scoring systems are organized such that a high score for a functional scale or global health status/QoL represents a high level of functioning or high QoL, but a high score for a symptom scale/item, as it relates to the colon- or rectum-specific module, represents a high level of symptomatology or dysfunction. The principle for scoring is to estimate the average of the items that contribute

to the scale; this is the raw score. A linear transformation is used to standardize the raw score, so that scores range from 0 to 100.<sup>10</sup>

## Statistical analysis

The results are presented as percentages and proportions. Distributions and frequencies were compared by  $\chi^2$  test. Age and length of stay were compared by unpaired *t*-tests. Since QoL data were not normally distributed, nonparametric methods were used in the statistical analysis. The patient groups were compared by Mann–Whitney U test and Kruskal–Wallis test. Survival was analyzed using the life table procedure (SPSS) for 5-y survival. Patients who underwent surgery in 2002 were included into the analysis as censored cases.  $P < 0.05$  was considered significant. The scoring was performed according to the EORTC-QLQ-C30 Scoring Manual: scales were calculated when at least half of the items were completed by the patients.<sup>10</sup> Data were analyzed using SPSS for Windows (Version 10.0, Chicago, IL, USA).

## Results

Of the 819 patients potentially eligible for the study, 407 were females and 412 males. The patients' age ranged from 42 to 89 y with an average age of 66.8 y. Survival for all patients after 5 y was 74.5%. During the time observed, 174 (21.2%) patients had died due to the disease. QoL data were available for 495 patients for at least one time point. For each time point, we received an average of 265 (32.4%) questionnaires as shown in Table 1. A total of 87 (10.6%) patients refused to take part in the study, 41 (5%) addresses of patients were unknown and 22 (2.6%) questionnaires are still missing. There were no significant differences between the group of patients with and without QoL data in terms of gender, age, type of surgery and adjuvant therapy. There were also no differences between men and

**Table 1** Number of patients and percentage with and without QoL data by time point

	QoL data available	No QoL data
Preoperative	265 (32.3%)	554 (67.7%)
Postoperative	254 (31.0%)	565 (69.0%)
3 months after surgery	305 (37.2%)	514 (62.8%)
6 months after surgery	269 (32.8%)	550 (67.2%)
12 months after surgery	380 (46.3%)	439 (54.7%)
24 months after surgery	121 (14.7%)	698 (85.3%)

Total number of patients = 819.

women in these categories. Distribution of these factors was also similar between the surgical procedures. All comparisons were made by  $\chi^2$  test. Age was compared by dividing patients into groups 40–50, 51–60, 61–70, 71–80 and over 80 y.

In the group with QoL data, 66 patients received an abdominoperineal resection (APR) and 306 patients an anterior resection (AR). A total of 36 patients had an ultralow AR with Pouch (neorectum) and in 133 patients a resection of the lower sigmoid was performed. Temporary fecal diversion to protect the pelvic anastomosis was performed in 67 patients. Restoration of intestinal continuity occurred 3 months following the initial surgical procedure. In all rectal cancer patients with tumors of the lower two-thirds (AR with Pouch and APR), conventional mesorectal incision including total nerve sparing (when possible) was performed. Partial TME was performed for all upper-third tumors (AR). A description of the patients is given in Table 2.

### Type of surgery and sexual function

Comparing APR, AR with Pouch and AR with patients receiving resection of the lower sigmoid, one significant difference was seen in the EORTC-QLQ-C-30 scales. For the majority of the time period observed, both groups experienced similar functioning and symptoms. Significantly more problems with *constipation* were reported by patients receiving rectal resection after 3 months postsurgery (Table 3). In the specific module scales, significant differences were observed for the item 'impaired sexual function' from 3 months postsurgery until 24 months postsurgery (Figure 1). Strain from this impairment was seen at 6 and 12 months postoperation (Figure 2). Comparing patients receiving AR, AR with Pouch and APR, no differences were seen in the EORTC scales. In the module scales, we found sexual function significantly more impaired for patients after APR and AR with Pouch (Figure 3). Significantly more strain from impaired sexual function was reported at 3 and 12 months for patients after APR and AR with Pouch and after 6 months postsurgery for patients receiving APR (Figure 4).

### Gender, QoL and sexual function

The EORTC core questionnaire showed significant differences between men and women (Table 3). Physical functioning was better for men throughout the time observed. Scores for insomnia and fatigue were significantly higher for women than for men prior surgery, at discharge, and after 3 and 6 months

**Table 2** Characteristics of all patients enrolled grouped by availability of QoL data

Patient characteristics	Without QoL data	With QoL data	Total
N	278 <sup>a</sup>	495	819
Survival 5 y	68.4%	77.5%	74.5%
Complication rate	10.1%	9.5%	9.8%
Gender (female/male)	141/137	238/257	407/412
Age (mean/s.d.)	69.9 ( $\pm$ 13.2)	66.8 ( $\pm$ 10.9)	66.2 ( $\pm$ 12.1)
Sigmoid resection	56 (20.1%)	133 (26.7%)	201 (24.5%)
APR	45 (16.2%)	66 (13.3%)	116 (14.1%)
AR	161 (57.9%)	306 (61.8%)	491 (59.9%)
AR with Pouch	16 (5.8%)	36 (7.3%)	57 (7.9%)
<50	19 (6.8%)	49 (9.8%)	72 (8.8%)
50–59	47 (16.9%)	118 (23.8%)	176 (21.5%)
60–69	54 (19.4%)	160 (32.3%)	229 (28.0%)
70–79	80 (28.8%)	138 (28.1%)	232 (28.3%)
>80	73 (26.3%)	30 (5.9%)	105 (12.8%)
Missing	5 (1.8%)	0	5 (0.6%)
Chemotherapy only	49 (17.6%)	62 (12.5%)	126 (15.3%)
Radio/chemotherapy	124 (44.6%)	247 (49.9%)	393 (47.9%)
Unknown	13 (4.6%)	10 (2.0%)	26 (3.1%)
Tis	1 (0.4%)	0	2 (0.2%)
T1	25 (9.1%)	54 (10.9%)	81 (9.9%)
T2	55 (19.7%)	123 (24.8%)	184 (22.5%)
T3	124 (44.6%)	257 (51.9%)	392 (47.9%)
T4	32 (11.5%)	39 (7.8%)	73 (8.9%)
Unknown	41 (14.7%)	22 (4.4%)	87 (10.6%)
N0	126 (45.3%)	282 (56.9%)	428 (52.2%)
N1	77 (27.7%)	124 (25.0%)	220 (26.9%)
N2	49 (17.6%)	74 (14.9%)	127 (15.5%)
Unknown	26 (9.4%)	15 (3.0%)	44 (5.4%)
M0	197 (70.9%)	397 (80.2%)	635 (77.5%)
M1	62 (22.3%)	91 (18.3%)	157 (19.2%)
Unknown	19 (6.8%)	7 (1.4%)	27 (3.3%)

<sup>a</sup>Note that 46 patients with sexual dysfunction prior surgery were excluded from the sample.

postsurgery (Table 3). In the tumor-specific questionnaire, women scored higher for distress through the medical treatment than men. Both experienced limitations in their sexual life, but men had significantly higher scores than women and felt more distress through restricted sexual function than women (Figures 5 and 6).

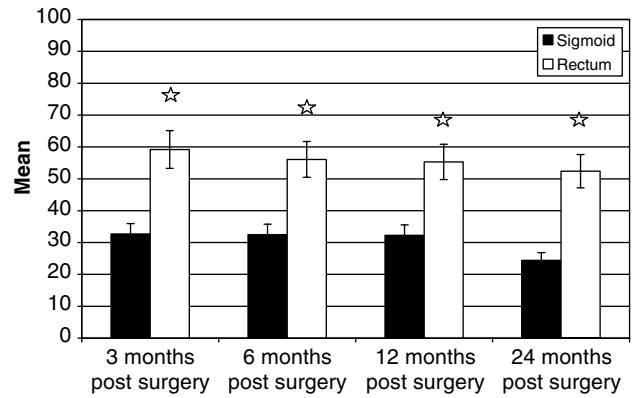
### Age, QoL and sexual function

We divided patients into groups <50, 50–59, 60–69, 70–79 and over 80 y. Significant differences were seen between patients over 70 and patients aged 69 y and younger in the EORTC scales. Physical functioning was better for patients aged 69 y and younger throughout the time observed except at discharge (Table 3). Sexual function was impaired more in

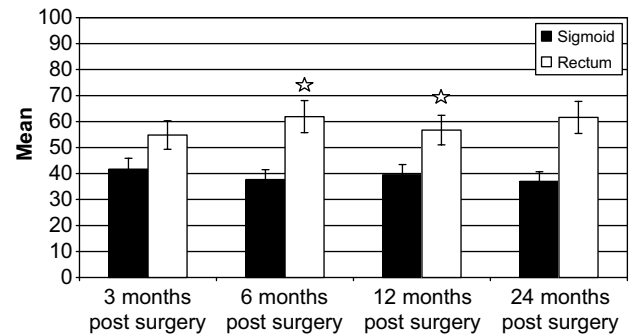
**Table 3** Significant differences ( $P < 0.05$ ) in EORTC scales, grouped by gender, age and tumor site

	Prior surgery	At discharge	3 months postsurgery	6 months postsurgery	12 months postsurgery	24 months postsurgery
Male/female	FA (m = 22.3, f = 37.8) SL (m = 22.1, f = 36.7)	PF (m = 64.3, f = 50.6) EF (m = 63.9, f = 52.4) FA (m = 50.3, f = 64.7)	PF (m = 74.4, f = 60.3) GH (m = 61.8, f = 54.3) FA (m = 39.6, f = 52.3) NA/V (m = 7.2, f = 14.9) PF (69 = 72.7, 70 = 58.1)	PF (m = 76.6, f = 66.3) SL (m = 25.5, f = 39.5)	PF (m = 77.1, f = 69.6)	
Aged 69 and younger/ aged 70 and older Sigmoid/rectum	PF (69 = 85.9, 70 = 74.6)		PF (69 = 72.7, 70 = 58.1) CO (Sigmoid = 9.1, rectum = 22.8)	PF (69 = 76.2, 70 = 63.6)	PF (69 = 78.4, 70 = 64.0)	

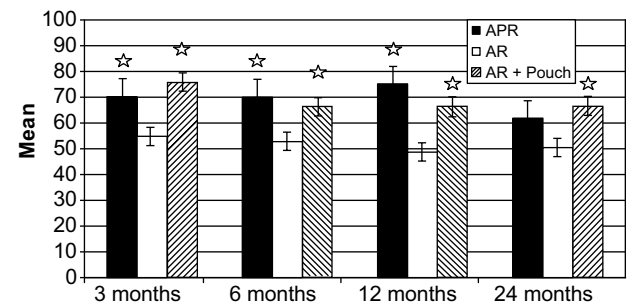
Values are mean values. FA: fatigue; SL: insomnia; PF: physical functioning; EF: emotional functioning; GH: global health; NA/V: nausea/vomiting; CO: constipation.



**Figure 1** Module scale scores for sexual function after surgery, grouped by tumor site (rectum/sigmoid). Significant differences ( $P < 0.05$ ) are indicated by stars.

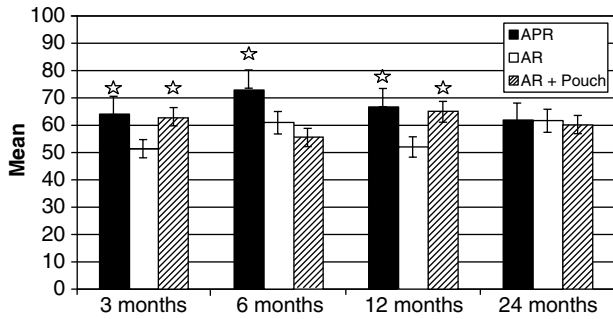


**Figure 2** Module scale scores for strain caused by impaired sexual function, grouped by tumor site (rectum/sigmoid). Significant differences ( $P < 0.05$ ) are indicated by stars.

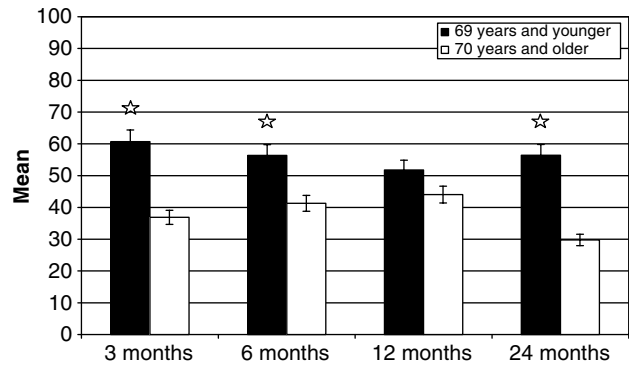


**Figure 3** Module scale scores for sexual function after surgery, grouped by operation (APR: abdominoperineal resection; AR: anterior resection (with pouch)). Significant differences ( $P < 0.05$ ) are indicated by stars.

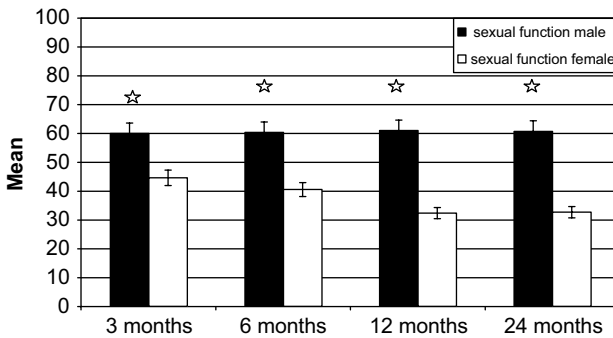
patients aged 69 y and younger at 3, 6 and 24 months (Figure 7). The impairment caused significantly more stress from 3 months until 24 months postsurgery than for those patients aged 70 y and older (Figure 8). Treatment strain was significantly increased for patients aged 70 y and older after 3 months but decreased over time, while at the same



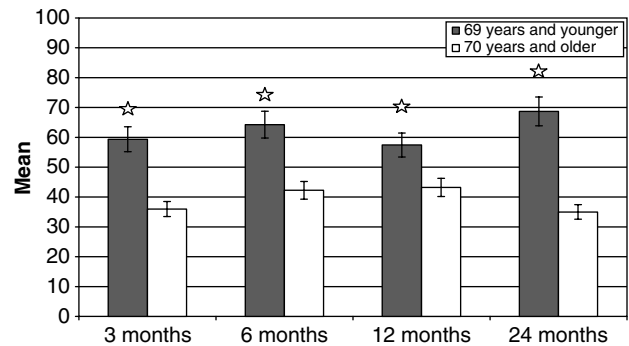
**Figure 4** Module scale scores for strain caused by impaired sexual function, grouped by operation. Significant differences ( $P < 0.05$ ) are indicated by stars (APR: abdominoperineal resection; AR: anterior resection (with pouch)).



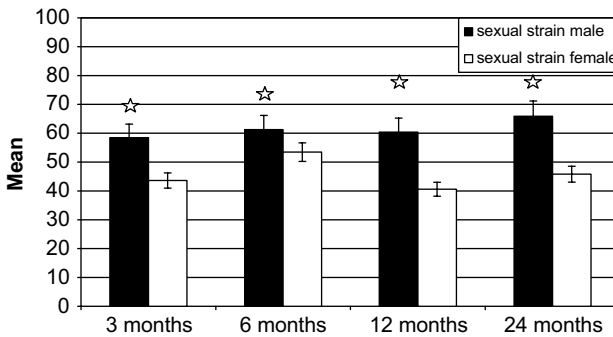
**Figure 7** Module scale scores for sexual function after surgery in patients aged 69 y and younger and patients aged 70 y and older. Significant differences ( $P < 0.05$ ) are indicated by stars.



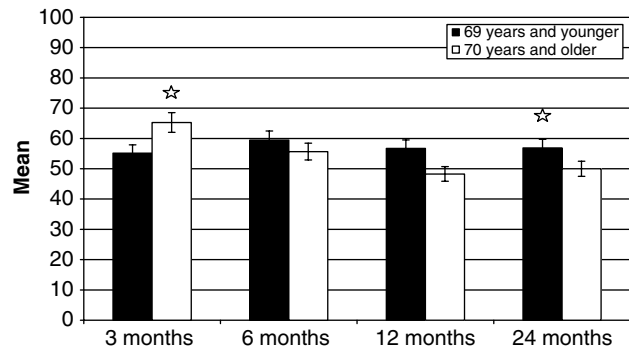
**Figure 5** Module scale scores for sexual function in men and women after surgery for rectal cancer. Significant differences ( $P < 0.05$ ) are indicated by stars.



**Figure 8** Module scale scores for strain caused by sexual impairment in patients aged 69 y and younger and patients aged 70 y and older. Significant differences ( $P < 0.05$ ) are indicated by stars.



**Figure 6** Module scale scores for strain caused by impaired sexual function in men and women after surgery for rectal cancer. Significant differences ( $P < 0.05$ ) are indicated by stars.



**Figure 9** Module scale scores for the item 'Treatment strain' for patients aged 69 y and younger and patients aged 70 y and older. Significant differences ( $P < 0.05$ ) are indicated by stars.

time increased for patients aged 69 y and younger. After 2 y postsurgery, treatment strain was higher for patients aged 69 y and younger than those patients aged 70 y and older (Figure 9).

## Discussion

Therapy for rectal cancer can have a detrimental effect on sexual function and sexual enjoyment in

men and women.<sup>11</sup> Accurate assessment of impaired sexual function with questionnaires however is difficult, because many patients find questions related to sexual function too intrusive and as a consequence choose not to complete them. This problem has been observed in several studies.<sup>12–14</sup> Therefore, various methods of measuring sexual

function ranging from clinical tests to personal interviews have been applied and have as a result led to inconsistent findings. Clinical tests usually do not include QoL aspects, which are important to assess the patient's subjective well-being as well. Furthermore, some studies show that sexual function after rectal resection seems to be better in women than in men.<sup>6</sup> Thus gender distribution should be adjusted when conducting research on that subject. Studies also indicate that patients undergoing an APR have worse sexual function than those patients who received sphincter preserving surgery for rectal cancer.<sup>13,14</sup> Only in few investigations an effect of age on sexual function after rectal cancer surgery was found, but the findings were inconsistent.<sup>15</sup> In summary, measuring sexuality after surgery for rectal cancer remains somewhat difficult due to assessment problems and the unknown impact of potential confounders. Furthermore, appropriate methodology has to be applied so that missing data are minimized. Therefore, to date, information on sexual function after surgery for rectal cancer is unsatisfactory due to methodological limitations in the majority of studies.<sup>6,16</sup>

Investigations on the effect of surgical techniques found sexual function after APR worse than after sphincter preserving surgery.<sup>6,13,14</sup> Balslev and Harling<sup>17</sup> assessed sexual function in patients who had received rectal cancer surgery retrospectively by interviews. The researchers found patients with APR to have worse sexual function than those with AR. An effect of age or tumor stage on sexual function was not observed. Furthermore, they discovered that potency was usually regained within 2 y after surgery.<sup>17</sup> Part of these findings might be influenced by the study design, which included interviews, and a relatively small sample size. In a study by Maurer *et al*,<sup>18</sup> sexual function was better after TME and nerve preservation than after conventional surgery for rectal cancer. However, sexual function of the whole sample was decreased in their study. Further research could confirm the potential benefit of nerve preserving TME on perceived sexual function in patients with rectal cancer: Maas *et al*<sup>19</sup> investigated sexual and bladder function after preservation of the pelvic autonomic nerves during TME. They found impotence to be related to sacrifice of the inferior hypogastric plexus and ejaculatory dysfunction to be related to sacrifice of the superior hypogastric plexus. However, sexual function did not change during follow-up in that investigation.<sup>19</sup> In studies where surgery was combined with radiotherapy in advanced tumors, the rate of reported sexual dysfunction increased independent of type of surgery.<sup>20</sup> Finally, new techniques such as the laparoscopically assisted rectal resection seem to be associated with higher rates of male sexual dysfunction in comparison with the conventional approach.<sup>21</sup>

The influence of gender on sexual function after rectal surgery was analyzed in very few studies. Most research was undertaken looking at the effect of gender on survival and tumor location. Engel *et al*<sup>13</sup> and Camilleri-Brennan and Steele<sup>14</sup> found male gender to be associated with worse sexual function than in women after surgery for rectal cancer. However, Mannaerts *et al*<sup>22</sup> studied patients with advanced rectal cancer and found the same extent of impaired sexual function (50%) in male and female patients after comprehensive treatment for rectal cancer. Other research indicates that men suffer more from erectile dysfunction and retrograde ejaculation while women experience pain during intercourse.<sup>23</sup> Chatwin *et al*<sup>5</sup> looked at sexual function and defactory dynamics after rectal surgery. In their retrospective study, nine out of 13 men reported sexual dysfunction after surgery. However, a detrimental effect on QoL was not seen, which might be due to the retrospective design and small sample size.<sup>5</sup> Furthermore, the study focused on men only.

Research regarding the effect of age on sexual function after rectal cancer surgery is also rare. In a series of 26 male patients undergoing APR of the rectum for cancer, Danzi *et al*<sup>15</sup> looked at sexual function after surgery administering questionnaires to the patients before and after the operation. Sexual dysfunction was seen in 61.5% of all patients with a strong impact of age on postoperative sexual function. In patients aged 58–65 y, sexual function was impaired in 40% of all cases. Tumor stage had no effect on sexual function. The researchers concluded that age of the patients was the most important factor related to sexual activity after rectal resection for cancer.<sup>15</sup> The sample size included 43 patients, did not adjust confounders and focused on men. In conclusion, the majority of the inconsistencies regarding the assessment of postoperative sexual function are related to study design, sample size and methodology applied. Furthermore, only few researchers used validated or tumor-specific instruments. Therefore, there might also be a lack of specific information to interpret the results.

In the present study, the effects of type of surgery, age and gender on QoL and sexual function were investigated in a prospective setting. The instruments applied had strong psychometric properties. Especially, EORTC-QLQ-C30 has proven its reliability in various studies.<sup>24,25</sup> Because the official module for colorectal cancer of EORTC is not validated yet, we used a recently validated instrument for rectal cancer patients that was developed parallel to the official module of EORTC.<sup>9,26</sup> We added questions on sexual function after surgery and stress related to loss of sexual function. The additional questions focused on fecal incontinence, diarrhea, sexual function, sexual enjoyment, colostomy-related problems and use of aids/devices for colostomy. Finally, a question about adjuvant

therapy and medication was included. Thereafter, the module for patients with colorectal cancer consisted of 39 items and showed sufficient reliability and good face validity.<sup>9</sup> Looking at the overall QoL, we found that patients receiving a resection of the lower sigmoid had better function and fewer symptoms throughout the time observed. Specifically, we found sexual function worse in patients receiving an APR and AR with Pouch, which might be due to the extended surgery in the pelvis and increased damage sustained to the autonomic pelvic nerves and pelvic floor. Sexual function and sexual enjoyment were impaired for women and men, although men had worse scores and as a result increased strain through the impairment. Strain and impairment tended to remain over time. Age had an effect on sexual function and enjoyment after surgery. While patients aged 69 y and younger suffered significantly more from impaired sexual function, patients older than 70 y had less stress due to the loss of sexual function. This effect remained over time. Patients older than 70 y experienced more treatment strain after discharge and after 3 months postsurgery but performed better over time. During the same time, treatment strain in patients aged 69 y and younger increased and was significantly higher after 2 y. Our data indicate that this change is associated with sexual impairment and sexual enjoyment in these patients. The distribution however of patients per age group (327 < 70 vs 168 > 70) could also be part of this phenomenon.

The strengths of the study are grounded in their methodology, which included prospective assessment with validated instruments and allowed adjustment of potential confounders.<sup>16</sup> However, some specific information on sexual function in men is missing: in addition to the cancer-specific module, we intended to use the validated German version of the International Index of Erectile Function (IIEF), which is recommended in patients with sexual dysfunction orders.<sup>27</sup> In 23 prospective interviews, men aged 45–82 y rated the instrument to be intrusive. A total of 19 patients (82%) said they would not fill out the questionnaire, because it went into too much detail and they felt that they lost their privacy. Therefore, we did not use IIEF to measure the extent of impaired sexual function after rectal surgery. Although the specific module asks about impairment of sexual function and strain through the impairment, the present study is limited to show detailed effects of rectal surgery on sexual function such as erectile function and ejaculation ability. In an ongoing study of our research group with prostate cancer patients, we experienced similar findings using IIEF. About 54% of the patients participating in the study broke off after 3 months due to the questions in IIEF. The problem with missing data related to questions about sexuality is known. Studies from the United States and Europe have indicated similar experiences.<sup>28,29</sup> However, re-

searchers from Asia had opposite findings: in a study by Kim *et al*,<sup>30</sup> more than 80% of patients with rectal cancer answered IIEF when they were asked for sexual and voiding function after TME with pelvic autonomic nerve preservation. Thus there seem to be some cultural differences in the perception of questions concerning sexual function.

In this study, we asked about sexual impairment after surgery. The preoperative assessment of sexual function was performed by interviews on admission to exclude patients with existing sexual dysfunctions. As these results bear the risk of an interviewer bias, we did not use these data in our study. To assess accurately potential effects of surgery on postoperative sexual function, we carefully chose our wording in the questionnaires. As a consequence, we cannot provide comparable preoperative data on sexual function. Furthermore, due to lack of complete panels (only 64 patients completed questionnaires at all six points of assessment), the analysis of repeated measure scores over time was not possible. Therefore, the results may potentially be biased, as we do not know if the patients who dropped out are missing at random or missing due to advanced disease. However, we hypothesize that both groups are comparable since we found no evidence that patients with or without QoL data differed in medical parameters (tumor stage, radio/chemotherapy, etc). For stratification, we compared operations and age for men and women separately. The differences found remained significant. Still, conclusions from this study should be made with caution.

The aim of the study was to assess prospective changes of sexual function and QoL after surgery for colorectal cancer with special focus on the impact of surgical procedure, gender and age on sexual function. Only longitudinal prospective assessment of QoL in oncology allows accurate detection of short- and long-term effects of treatment as shown in various studies.<sup>16</sup> To date, there are only a few studies that collect QoL data in daily routine practice, but this should change.<sup>16</sup> Assessment of sexual function and QoL can help to identify those areas, before and after surgery, that have been affected by the disease or by its treatment so that special support in terms of counseling can be directed toward improving specific areas of QoL.<sup>31</sup> Küchler *et al*<sup>32</sup> showed that patients who had psychosocial support under these circumstances resulted in higher QoL levels before and after the intervention.

## References

- 1 Becker N, Muscat JE, Wynder EL. Cancer morbidity in the United States and Germany. *J Cancer Res Clin Oncol* 2001; 127: 293–300.

- 2 Enker WE. Potency, cure, and local control in the operative treatment of rectal cancer. *Arch Surg* 1992; **127**: 1396–1402.
- 3 Heald RJ, Ryall RDH. Recurrence and survival after total mesorectal excision for rectal cancer. *Lancet* 1986; **28**: 1479–1482.
- 4 Chorost MI *et al*. Sexual dysfunction, informed consent and multimodality therapy for rectal cancer. *Am J Surg* 2000; **179**: 271–274.
- 5 Chatwin NA, Ribordy M, Givel JC. Clinical outcomes and quality of life after low anterior resection for rectal cancer. *Eur J Surg* 2002; **168**: 297–301.
- 6 Engel J *et al*. Quality of life in rectal cancer patients: a four-year prospective study. *Ann Surg* 2003; **238**: 203–213.
- 7 Aaronson NK, Ahmedzai S, Bergman B. The European Organization for Research and Treatment of Cancer. QLQ C-30: a quality of life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993; **85**: 365–376.
- 8 Sprangers MA *et al*. The European Organization for Research and Treatment of Cancer approach to developing questionnaire modules: an update and overview. EORTC Quality of Life Study Group. *Qual Life Res* 1998; **7**: 291–300.
- 9 Davidson-Homewood J *et al*. Development of a disease specific questionnaire to supplement a generic tool for QoL in colorectal cancer. *Psychooncology* 2003; **12**: 675–685.
- 10 Fayers P, Aaronson N, Bjordal K, Sullivan M. *EORTC QLQ-C30 Scoring Manual*. EORTC Quality of Life Study Group: Brussels, 1995.
- 11 Pocard M *et al*. A prospective study of sexual and urinary function before and after total mesorectal excision with autonomic nerve preservation for rectal cancer. *Surgery* 2002; **131**: 368–372.
- 12 Sprangers MA, te Velde A, Aaronson NK. The construction and testing of the EORTC colorectal cancer-specific quality of life questionnaire module (QLQ-CR38). European Organization for Research and Treatment of Cancer Study Group on Quality of Life. *Eur J Cancer* 1999; **35**: 238–247.
- 13 Engel J *et al*. Comparison of breast and rectal cancer patients' quality of life: results of a four year prospective field study. *Eur J Cancer Care* 2003; **2**: 215–223.
- 14 Camilleri-Brennan J, Steele RJC. Prospective analysis of quality of life and survival following mesorectal excision for rectal cancer. *Br J Surg* 2001; **88**: 1617–1622.
- 15 Danzi M, Ferulano GP, Abate S, Califano G. Male sexual function after abdominoperineal resection for rectal cancer. *Dis Colon Rectum* 1983; **26**: 665–668.
- 16 Wood-Dauphinee S. Assessing quality of life in clinical research: from where have we come and where are we going? *J Clin Epidemiol* 1999; **52**: 355–363.
- 17 Balslev I, Harling H. Sexual dysfunction following operation for carcinoma of the rectum. *Dis Colon Rectum* 1983; **26**: 785–788.
- 18 Maurer CA *et al*. Total mesorectal excision preserves male genital function compared with conventional rectal cancer surgery. *Br J Surg* 2001; **88**: 1501–1505.
- 19 Maas CP *et al*. A prospective study on radical and nerve-preserving surgery for rectal cancer in the Netherlands. *Eur J Surg Oncol* 2000; **26**: 751–757.
- 20 Holm T, Singnomklao T, Rutquist L-E, Cedermark B. Adjuvant preoperative radiotherapy in patients with rectal carcinoma. Adverse effects during long term follow up of two randomized trials. *Cancer* 1996; **78**: 968–976.
- 21 Quah HM, Jayne DG, Eu KW, Seow-Choen F. Bladder and sexual dysfunction following laparoscopically assisted and conventional open mesorectal resection for cancer. *Br J Surg* 2002; **89**: 1551–1556.
- 22 Mannaerts GH *et al*. Urologic and sexual morbidity following multimodality treatment for locally advanced primary and locally recurrent rectal cancer. *Eur J Surg Oncol* 2001; **27**: 265–272.
- 23 Hjortrup A *et al*. Sexual dysfunction after low anterior resection for midrectal cancer. *Acta Chir Scand* 1984; **150**: 687–688.
- 24 Maisey NR *et al*. Baseline quality of life predicts survival with advanced colorectal cancer. *Eur J Cancer* 2002; **38**: 1351–1357.
- 25 McArdle CS, McMillan DC, Hole DJ. Male gender adversely affects survival following surgery for colorectal cancer. *Br J Surg* 2003; **90**: 711–715.
- 26 EORTC study group on quality of Life. EORTC Quality of Life questionnaires. Available at <http://www.eortc.be/home/qol/modules.htm>. Accessed January 26, 2004.
- 27 Wiltink J *et al*. Validation of the German version of the International Index of Erectile Function (IIEF) in patients with erectile dysfunction, Peyronie's disease and controls. *Int J Impot Res* 2003; **15**: 192–197.
- 28 Gacci M *et al*. Urinary symptoms, quality of life and sexual function in patients with benign prostatic hypertrophy before and after prostatectomy: a prospective study. *Br J Urol* 2003; **91**: 196–200.
- 29 Derby CA *et al*. Measurement of erectile dysfunction in population-based studies: the use of a single question self-assessment in the Massachusetts Male Aging Study. *J Impot Res* 2000; **12**: 197–204.
- 30 Kim NK *et al*. Assessment of sexual and voiding function after total mesorectal excision with pelvic autonomic nerve preservation in males with rectal cancer. *Dis Colon Rectum* 2002; **45**: 1178–1185.
- 31 Nesbakken A *et al*. Bladder and sexual dysfunction after mesorectal excision for rectal cancer. *Br J Surg* 2000; **87**: 206–210.
- 32 Küchler Th *et al*. Impact of psychotherapeutic support on gastrointestinal cancer patients undergoing surgery: 'survival results of a trial'. *Hepatogastroenterology* 1999; **46**: 322–325.