



ELSEVIER

# Journal of Coloproctology

www.jcol.org.br



## Original article

# Quality of life assessment in the late postoperative period of patients with rectal cancer submitted to total mesorectal excision

Paulo Rocha França Neto<sup>a,\*</sup>, Fábio Lopes de Queiroz<sup>a</sup>,  
Isabella Rocha França Longo Staino<sup>b</sup>, Antônio Lacerda Filho<sup>c</sup>

<sup>a</sup>Coloproctology Clinic of Hospital Felício Rocho, Belo Horizonte, MG, Brazil

<sup>b</sup>Medical School of Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, MG, Brazil

<sup>c</sup>Surgery Department of the Medical School of UFMG, Belo Horizonte, MG, Brazil

## ARTICLE INFO

### Article history:

Received 15 February 2013

Accepted 26 March 2013

### Keywords:

Quality of life

Rectal neoplasms

Colorectal surgery

Postoperative evaluation

## ABSTRACT

After the introduction of total mesorectal excision (TME) and radiochemotherapy, excellent results have been achieved in the treatment of patients with rectal cancer. With better oncologic control of the disease, the functional results of this type of therapeutic approach and their impact on the quality of life (QOL) of patients started to be increasingly valued. The aims of this study were to evaluate the QOL of patients with rectal cancer submitted to TME in the late postoperative period and the possible factors that directly influence their quality of life. A total of 72 patients submitted to TME due to extraperitoneal rectal tumor were assessed, after at least one postoperative year, by applying QOL questionnaires (EORTC QLQ-C30 and EORTC QLQ-CR38), in addition to a specific clinical questionnaire and rectal examination. Patients were evaluated regarding gender, age, indication of radiotherapy and chemotherapy preoperatively, length of postoperative period, distance from the anastomosis to the anal verge and general health status. The mean overall health status of patients was satisfactory (82.06). There was no difference in overall health status between patients with respect to gender, but the male patients had less insomnia ( $p = 0.002$ ), better future prospects ( $p = 0.011$ ), fewer effects of chemotherapy ( $p = 0.020$ ) and better sexual function ( $p < 0.0001$ ). Patients younger than 50 years had fewer urinary problems ( $p = 0.035$ ), whereas those older than 65 years reported poorer sexual function ( $p = 0.012$ ). Patients who underwent neoadjuvant therapy had more diarrhea ( $p = 0.012$ ). Quality of life did not change significantly with time after surgery and the distance from the anastomosis to the anal verge. We conclude that patients undergoing TME have a good quality of life one year after the surgery and that the factors capable of affecting QOL should be identified and improved.

© 2013 Elsevier Editora Ltda. Este é um artigo Open Access sob a licença de [CC BY-NC-ND](https://creativecommons.org/licenses/by-nc-nd/4.0/)

\* Corresponding author.

E-mail: paulorochoafranca@gmail.com (P.R. França-Neto)

## Avaliação da qualidade de vida de pacientes com câncer de reto submetidos a excisão total do mesorreto em pós-operatório tardio

### R E S U M O

#### Palavras-chave:

Qualidade de vida  
Neoplasias retais  
Cirurgia colorretal  
Pós-operatório

A introdução da cirurgia de excisão total do mesorreto (ETM) e da radioquimioterapia propiciaram excelentes resultados no tratamento do câncer de reto. Com o melhor controle oncológico da doença, os resultados funcionais deste tipo de abordagem terapêutica e seu impacto na qualidade de vida (QV) dos pacientes passaram a ser cada vez mais valorizados. Os objetivos do presente estudo foram avaliar a QV dos pacientes portadores de câncer retal submetidos à ETM, em pós-operatório tardio e os possíveis fatores capazes de influenciar diretamente na qualidade de vida dos mesmos. Foram avaliados 72 pacientes submetidos à ETM por tumor de reto extraperitoneal, com no mínimo, um ano de pós-operatório, por meio da aplicação de questionários de QV (EORTC QLQ-C30 e EORTC QLQ-CR38), além de questionário clínico específico e exame proctológico. Os pacientes foram avaliados quanto a gênero, idade, realização de radioterapia e quimioterapia pré-operatórias, tempo de pós-operatório, distância da anastomose à margem anal e estado global de saúde. A média do estado global de saúde dos pacientes avaliados foi satisfatória (82,06). Não se observou diferença na saúde global entre os pacientes com relação ao gênero, porém os pacientes do sexo masculino apresentaram menos insônia ( $p = 0,002$ ), melhores perspectivas futuras ( $p = 0,011$ ), menos efeitos da quimioterapia ( $p = 0,020$ ) e melhor função sexual ( $p < 0,0001$ ). Os pacientes com menos de 50 anos apresentaram menos problemas miccionais ( $p = 0,035$ ), já os com mais de 65 anos relataram uma pior função sexual ( $p = 0,012$ ). Os pacientes que realizaram neoadjuvância apresentaram mais diarreia ( $p = 0,012$ ). A qualidade de vida não se alterou significativamente de acordo com o tempo de pós-operatório e distância da anastomose à margem anal. Conclui-se que os pacientes submetidos à ETM apresentam uma boa qualidade de vida após um ano de cirurgia e que os fatores envolvidos capazes de influenciar a QV devem ser identificados e otimizados.

© 2013 Elsevier Editora Ltda. Este é um artigo Open Access sob a licença de [CC BY-NC-ND](#)

## Introduction

The multimodal therapy currently used for the treatment of rectal cancer has enabled great success in disease control. In contrast, advances in multimodal therapy were not as evident in terms of functional outcomes, especially in tumors located in the extraperitoneal rectum. The total mesorectal excision (TME) surgery with radiotherapy and chemotherapy can result in side effects such as increased defecation frequency and urgency, as well as sexual and urinary dysfunction, which may directly influence patient quality of life (QOL).

The pursuit of quality of life by achieving better functional outcomes related to the surgical treatment of rectal cancer was initially emphasized in the 1970s. Since then, this aspect of treatment has been increasingly valued, and is currently of great importance in the treatment of the disease.<sup>1</sup>

Once excellent oncological results have been achieved leading to an increase in survival, it became apparent the concern with the functional results of this therapeutic approach, as well as the mechanisms involved in its genesis and the ways to improve them. Since the introduction of TME as the standard treatment for middle and low rectal cancer, several late functional results have been observed in patients submitted to surgery, although not always shown in a well-structured and reliable manner.

Thus, it becomes of great interest to perform a precise and objective QOL assessment, as well as of factors that could in-

fluence QOL improvement. Therefore, this study aims to evaluate the QOL of patients with rectal cancer submitted to TME in the late postoperative period, by applying validated questionnaires with emphasis on anorectal, as well as sexual and urinary functions, seeking to identify possible factors capable of directly influencing QOL.

## Methods

A total of 72 patients undergoing total mesorectal excision for extra-peritoneal rectal adenocarcinoma were evaluated, at least one year postoperatively, which were selected from direct analysis of patients' charts from the Service of Coloproctology of Hospital Felício Rocho, from January 2000 to December 2009. All patients were operated on by surgeons specialized in colorectal surgeries with adequate training to perform the TME technique with low colorectal or coloanal anastomosis, with or without radiotherapy and/or associated chemotherapy.

Patients with locoregional or systemic recurrence, ostomy patients, patients with other malignancies capable of impacting on quality of life, terminal patients and those with severe decompensated systemic disease and great negative impact on overall quality of life were excluded from the study. Patients with cognitive deficits, decompensated psychiatric disorders and illiterate patients unable to read and/or understand the questionnaires and their correct completion were

also excluded, as well as those who did not appropriately fill out the questionnaires or failed to respond all or most of the questionnaire questions.

Patients were contacted by telephone and informed about the study. Those who agreed to participate were recruited for the interview and physical examination.

Patients were interviewed and examined at the Coloproctology Outpatient Clinic of Hospital Felício Rocho or in private practice and filled out the questionnaires in a private room, alone and in quietness. Some patients preferred to answer the questionnaires in their homes and return them after completion. Doubts on any question were always clarified by one of the researchers (PRFN), so that all questionnaires were answered adequately.

The quality of life of patients was assessed through the EORTC QLQ-C30 and EORTC QLQ-CR38 questionnaires. A specific standardized clinical questionnaire, developed by the researchers, was also used to assess whether the patient had undergone neoadjuvant and adjuvant treatments, presence of comorbidities and postoperative time. Patients underwent anorectal examination that included assessment of the distance from the anastomosis to the anal verge, by digital exam and measuring the distance found with a ruler. All data obtained from the questionnaires, as well as anorectal examination, were entered in the spreadsheet software in Microsoft Office Excel (2007) and statistical analysis was performed with SPSS, release 13.0 (SPSS Inc., Chicago, IL, USA).

The EORTC QLQ-C30 questionnaire contains 30 items that can be subdivided into five functional scales (physical, performance, emotional, cognitive and social), a measure of overall quality of life, symptom assessment (fatigue, nausea and vomiting, pain, dyspnea, insomnia, loss of appetite, constipation and diarrhea) and evaluation of financial difficulties.<sup>2-4</sup>

The EORTC QLQ-CR38 was designed especially for the evaluation of colorectal cancer (CRC) therapy from the patient's perspective.<sup>5</sup> It is subdivided into four functional scales: body image, future prospects, sexual pleasure and sexual function, plus eight symptom scales: problems with urination, gastrointestinal symptoms, side effects of chemotherapy, defecation problems, stoma-related problems, male and female sexual problems and weight loss.

The 68 questions of the EORTC QLQ-C30 and QLQ-CR38 questionnaires were designed to be aggregated, resulting in 27 variables for analysis. Patients' answers were combined and converted into a scale of 0 to 100 according to the recommendations provided by EORTC.<sup>3</sup> Each patient's score was expressed as a number in a scale of 0 to 100, where 0 is the worst and 100 the best in functional scales and 0 represents the best and 100 the worst in symptom scales. A high score for a functional scale represents a higher functional level, and a high score for overall health status represents high quality of life. Moreover, a high score for a symptom scale represents high level of symptoms and problems.

Among the items evaluated, the overall health status is assessed in EORTC QLQ-C30. Patients with a score > 80 on a scale ranging from 0 to 100 have good quality of life.

After the EORTC QLQ-C30 and QLQ-CR38 questionnaires were applied, scores were calculated for each assessed item, as recommended by the EORTC. Then, these scores were compared between males and females, between different

age groups, among patients who underwent neoadjuvant radiochemotherapy and those who did not, between different postoperative periods and different distances from the anastomosis to the anal verge.

Regarding age, patients were divided into three groups: a group up to 50 years old, a group aged 50 years and one day to 65 years old and a group older than 65 years and one day old. According to the postoperative time, patients were divided into three groups. The first group consisted of patients with 1 year and a day up to 2 years postoperatively, the second group with 2 years and one day to four years postoperatively and the third group with more than 4 years and 1 day postoperatively. In relation to the distance from the anastomosis to the anal verge, the patients were divided into three groups: the first group with up to 2 cm from the anal verge of the anastomosis, the second group with 2.1 cm to 5 cm and the third group with a distance  $\geq 5.1$  cm.

Patients were also divided according to the overall health status into two groups (score greater than 80 and less than 80), and the statistical analysis was performed between these two groups and the scales of function and symptoms of the EORTC QLQ-C30 and EORTC QLQ-CR38 questionnaires.

This study was approved by the research ethics committee of Hospital Felício Rocho and Universidade Federal de Minas Gerais (SISNEP 0001.0.240.000-08). The EORTC QLQ-C30 and EORTC QLQ-CR38 questionnaires had their use authorized by the EORTC Quality of Life Group for this study.

### Statistical Analysis

The number of patients in the sample was defined by sample calculation as a minimum of 72 to achieve a significance level of 5% in all domains of the EORTC QLQ-C30 and EORTC QLQ-CR38 questionnaires. The analysis of the variables related to the quality of life indicators obtained from the scales was compared through means for data with normal distribution and medians for the others. We also compared the quality of life variables with the data regarding gender, age range, presence of neoadjuvant therapy, postoperative time, distance from the anastomosis to the anal verge and overall health status. The t test was used for variables with normal distribution. Kruskal-Wallis and Mann-Whitney tests were applied to the other variables. P values < 0.05 were considered statistically significant.

---

### Results

Among the 72 patients evaluated, there was a predominance of males (n = 39, 54.2%) with a mean age of 61.9 years, and most were between 50 and 65 years (n = 32, 44.4%). Regarding patient comorbidities, hypertension and diabetes mellitus were the most prevalent ones (n = 19 and n = 8, respectively). Neoadjuvant treatment with radiotherapy and chemotherapy was performed in 35 patients (48.6%), while seven (9.7%) were referred for radiotherapy in the postoperative period associated with systemic chemotherapy. Thus, 42 patients (58.33%) underwent multimodal treatment with surgery, radiotherapy and chemotherapy, performed pre or postoperatively. The mean post-operative follow-up of patients was four years

(ranging from 1-11 years). Regarding the distance from the anastomosis to the anal verge, the first group with distance from the anastomosis to the anal verge up to 2 cm consisted of 15 patients (20.83%), the second group with distance from 2.1 cm to 5 cm consisted of 47 patients (65.27%) and the third group with a distance  $\geq 5.1$  cm consisted of 10 patients (13.9%).

Regarding gender, when evaluating the results of the EORTC QLQ-C30 questionnaire, it was observed that for the overall health status, the medians were similar, but men had less insomnia than women, and this was the only symptom that showed a statistically significant difference among genders ( $p = 0.002$ ).

When assessing the EORTC QLQ-CR38 questionnaire, it was observed that men had better sexual function ( $p < 0.0001$ ) and better future prospects ( $p = 0.011$ ) than women. Regarding the symptom scales, women had worse effects of chemotherapy ( $p = 0.02$ ).

With regard to age, there were no statistically significant differences between the groups in relation to the EORTC QLQ-C30 questionnaire. Regarding the EORTC QLQ-CR38 questionnaire, patients up to 50 years had fewer urinary problems ( $p = 0.035$ ). Patients aged between 50 and 65 years reported better sexual function ( $p = 0.012$ ), which worsened in those older than 65 years. Regarding other items assessed there was no statistically significant difference between groups (Fig. 1).

Regarding patients submitted or not to neoadjuvant radiotherapy and chemotherapy, it was observed that patients who underwent this preoperative approach had more diarrhea than those who did not ( $p = 0.012$ ), and that was the only change with statistical significance.

There were no statistically significant differences between the items assessed in the EORTC QLQ-C30 and EORTC QLQ-CR38 questionnaires in relation to the three age groups assessed and postoperative follow-up.

The only statistically significant data related to the distance from the anastomosis to the anal verge was that patients with a distance greater than or equal to 5 cm had a worse effect of chemotherapy ( $p = 0.032$ ) compared to patients with a lower anastomosis.

Regarding the overall health status, 44 patients (61.1%) had scores  $\geq 80$ . The mean overall health status was 82.06, being 84.60 and 79.91, for males and females, respectively. Regarding age range, this same mean in patients up to 50 years was 85.42; between 50 and 65 years, it was 80.21 and above 65 years, it was 82.74.

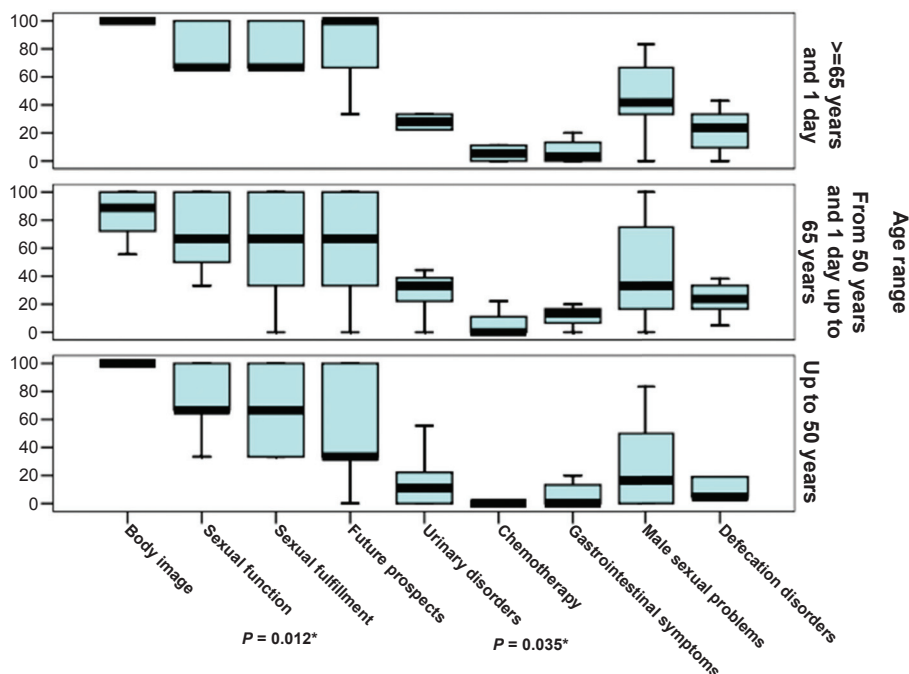
Regarding the EORTC QLQ-C30 questionnaire, patients with an overall health status with scores  $> 80$  had better physical function ( $p = 0.043$ ), better emotional ( $p = 0.028$ ) and social function ( $p < 0.0001$ ) and less fatigue ( $p = 0.006$ ). When the EORTC QLQ-CR38 items were assessed in patients with overall health status scores  $> 80$ , there were better future prospects ( $p = 0.032$ ), fewer gastrointestinal symptoms ( $p = 0.010$ ) and fewer defecation problems ( $p = 0.009$ ) (Tables 1 and 2).

## Discussion

The factors that influence quality of life of patients treated for rectal cancer should be progressively known and studied in an attempt to modify them, as to continue to provide an adequate quality of life to patients, in addition to effective disease control.

Several studies have investigated potential factors that influence functional outcomes in rectal cancer treatment.<sup>6-8</sup> The main factors that have been described are: gender, age, use of radiotherapy and chemotherapy, postoperative time and distance from the colorectal anastomosis to the anal verge.

Regarding gender, there was no difference in overall health between males and females, although males had less insom-



\* Considered p values  $< 0.05$ .

Fig. 1 – Quality of life assessment through the EORTC QLQ-CR38 questionnaire in relation to age.

**Table 1 – Overall health status assessment in relation to the items of EORTC QLQ-C30 questionnaire.**

EORTC QLQ-C30	Overall health status				p value
	< 80		≥ 80		
	Median	Interquartile interval	Median	Interquartile interval	
Physical function	93.33	20.00	100.00	6.67	0.043*
Role performance	100.00	29.17	100.00	0.00	—
Emotional function	75.00	41.67	91.67	33.33	0.028*
Cognitive function	83.33	33.33	100.00	33.33	0.352
Social function	83.33	33.33	100.00	0.00	< 0.0001*
Fatigue	11.11	30.56	0.00	11.11	0.006*
Nausea and vomiting	0.00	0.00	0.00	0.00	—
Pain	0.00	0.00	0.00	0.00	—
Dyspnea	0.00	0.00	0.00	0.00	—
Insomnia	0.00	33.33	0.00	33.33	—
Loss of appetite	0.00	0.00	0.00	0.00	—
Intestinal constipation	0.00	33.33	0.00	33.33	—
Diarrhea	0.00	58.33	0.00	33.33	0.349
Financial difficulty	0.00	33.33	0.00	0.00	—

\* p value with significance < 0.05.

**Table 2 – Overall health status assessment in relation to items of the EORTC QLQ-C38 questionnaire.**

EORTC QLQ-CR38	Overall health status				p value
	< 80		≥ 80		
	Median	Interquartile interval	Median	Interquartile interval	
Body image	88.89	41.67	100	22.22	0.134
Sexual function	66.67	33.34	33.33	58.34	0.682
Sexual fulfillment	66.67	33.34	66.67	66.67	0.108
Future prospects	33.33	66.67	66.67	66.67	0.032*
Urinary disorders	33.33	22.22	33.33	30.55	0.434
Chemotherapy effects	11.11	11.11	0.00	22.22	0.651
Gastrointestinal symptoms	20.00	23.34	6.67	20.00	0.010*
Female sexual problems	100.00	100.00	41.67	33.33	0.545
Male sexual problems	66.67	58.34	33.33	45.83	0.071
Bowel movement disorders	23.81	22.61	14.29	17.86	0.009*
Weight loss	0.00	33.33	0.00	0.00	—

\* p value with significance < 0.05.

nia ( $p = 0.002$ ), better future prospects ( $p = 0.011$ ) and fewer effects of chemotherapy ( $p = 0.020$ ). This has been described by other authors, who also found less insomnia among men, as well as less pain, loss of appetite and fatigue.<sup>9,10</sup> It has been suggested that the gender difference may be attributed to the attitude adopted by male patients, who tend to avoid answers that demonstrate weakness or dependency.<sup>11</sup>

Male patients showed better sexual function ( $p < 0.0001$ ), which is in disagreement with the results found by other authors.<sup>7,12,13</sup> Sexual problems usually occur due to damage to pelvic autonomic nerves and the pelvic floor during dissection of the rectum<sup>14,15</sup> and also by radiotherapy effects.<sup>16</sup> Some studies indicate, however, that part of the problem with post-operative sexual function may also be due to psychological factors and effects of advanced age at the time of surgery.<sup>17,18</sup> The mean age of female and male patients in our study was 62 and 61 years, respectively, so probably age had no significant effect on the sexual alterations, if we take gender into account. Psychological issues are extremely important in a satisfactory sexual activity. The psychological factors in the

present study probably had a negative effect on the female patients, represented by worse emotional function, than that reported by men.

Other aspects that must be considered are the taboos and prejudices still present in the Brazilian society, with respect to sexual activity. In general, males tend to omit unfavorable facts related to sexual activity when compared to women. It can still be considered very embarrassing for a male individual to reveal disclose erectile or ejaculatory dysfunctions or other difficulties during sex, in general. In this case, the information provided by patients does not always represent the reality.

Regarding age, patients older than 65 had worse sexual function than younger ones ( $p = 0.012$ ). This was also observed by other authors, who considered age as the factor more strongly related to the risk of loss of sexual function.<sup>19,20</sup>

The sexual function of patients between 50 and 65 years was better than that of patients younger than 50 years, which is also consistent with the observation by Schmidt et al.<sup>19</sup> This is probably due to the fact that sexual performance assess-

ment was more stringent in younger patients. Patients up to 50 years had fewer urinary problems ( $p = 0.035$ ), as observed by Mastracci et al.<sup>21</sup> That is because prostate changes in males and urinary incontinence in women occur mainly in older patients, definitely influencing the occurrence of urinary disorders, most commonly found in this older age group.

Patients who underwent neoadjuvant therapy had more diarrhea than those who did not ( $p = 0.012$ ). Sphincter function impairment has been a concern when performing pelvic radiotherapy, which can result in marked worsening of continence associated with loss of rectal reservoir or maintenance of a little compliant rectal stump.<sup>22</sup> It is likely that the diarrhea symptom, which was more frequent in patients submitted to radiotherapy, is an erroneous interpretation of the symptom, which has been often observed in outpatients. In this case, the patients tend to characterize fecal urgency and fecal incontinence as diarrhea. Dahlberg et al.<sup>23</sup> compared patients undergoing TME that received preoperative radiotherapy with those who did not. They observed that incontinence, urgency and difficulty were more important in irradiated patients. This study indicates that high doses of radiation affect bowel function at long-term. Thus, these specific effects of radiotherapy on anal continence should be discussed clearly and directly with the patient prior to performing multimodal treatment for rectal cancer.

Studies indicate that QOL after surgery for rectal cancer is dynamic,<sup>24,25</sup> being usually worse in the early postoperative period and improving with time. This time of improvement is variable in different studies and depends on the items assessed. The disease itself, apart from the consequences of its treatment, has a major impact on QoL.<sup>26</sup>

Patients with longer postoperative follow-up did not show significantly higher scores in their overall health status, or other variables related to QOL, when compared to patients with shorter postoperative follow-up. This was probably due to the fact that all patients were in the late postoperative period and as time goes by, they tend to increase resilience and coping capacity towards the situations brought on by the surgery. Furthermore, enough time had passed for the body to adapt to the changes caused by the surgical intervention. The distal colon started to acquire fecal storage capacity, which was once a function of the rectum, while the proximal colon increased its absorptive capacity. In turn, the pelvic inflammatory process has started to decline, reducing aggression to the pelvic innervation.<sup>25,27</sup> Other studies have also shown that the results related to quality of life function scales stabilized after 12 months postoperatively.<sup>25,27</sup>

The present study showed that an anastomosis more distant from the anal verge did not improve the quality of life of patients, which is in agreement with other authors, who also observed that the level of the anastomosis does not seem to affect functional outcomes related to quality of life.<sup>23,28</sup> Guren et al.<sup>29</sup> demonstrated that patients with an anastomosis up to 3 cm from the anal verge have more incontinence for gas and solid stools, when compared with patients with higher anastomoses. However, these authors found no difference in quality of life scores between patients with high and low anastomoses, as well as no linear association between the level of the anastomosis and fecal urgency, incontinence, or incomplete defecation.

Montesani et al.<sup>30</sup> observed that patients with anastomoses distant > 6 cm from the anal verge had the same function as an intact rectum, including compliance. Functional alterations such as fecal incontinence (5%), urgency (5%) and difficulty (10%) were observed in patients with anastomoses between 4 and 6 cm from the anal verge, being even more pronounced in patients submitted to coloanal anastomosis. These worse results seem to be the consequence of the loss of rectal reservoir function and low compliance of the small residual rectum, hence the indication by some authors, to create colonic reservoirs to act as a "neo-rectum".<sup>31,32,33</sup>

The only statistically significant result found in this study, concerning the height of the anastomosis, was that patients with a distance from the anastomosis to the anal verge  $\geq 5.1$  cm showed a worse effect of chemotherapy ( $p = 0.032$ ) when compared to the other groups. The effects of chemotherapy assessed by the questionnaire were the presence and intensity of hyposalivation, alopecia and dysgeusia, which seems to have no relation to the height of the anastomosis in relation to the anal verge.

Recently, Emmertsen and Laurberg proposed the use of a specific questionnaire to assess the impact of low rectosigmoidectomy on bowel function and quality of life in patients with rectal cancer.<sup>34</sup> The evaluation through scores for the intensity of the so-called "low anterior resection syndrome" ("LARS score") showed significant correlation with patient quality of life<sup>34</sup> and will certainly become another important tool for the objective functional assessment of patients submitted to surgical procedures for rectal cancer.

Regarding the assessment of overall health status through the EORTC QLQ-C30 questionnaire, a mean value of 82.06 was observed. This means that most patients undergoing TME showed good quality of life in the late postoperative period. One possible explanation for this satisfactory result is the time elapsed since surgery, which results in the body's adaptation to the new reality brought on by the treatment. Another probable reason is the performance of a standardized TME surgery within the recommended technical and anatomical principles, which provides better bowel function and lower rates of pelvic nerve injury with less voiding and sexual dysfunction and hence, better quality of life.

It must also be taken into account that patients submitted to neoadjuvant radiotherapy had overall health status scores similar to those who did not undergo this type of treatment. This may be due to the performance of radiotherapy in a reference center, by professionals dedicated to pelvic irradiation, which probably resulted in fewer adverse effects that affected, to a lesser extent, patient QOL.

Patients with good overall health status had better physical, emotional and social function, as well as less fatigue, better prospects, fewer gastrointestinal symptoms and bowel movement problems. These items are certainly related to a better or worse overall health assessment, directly influencing patients' perception of their quality of life. However, it was believed to be necessary to establish this correlation, as it corroborates which main factors should be corrected or improved to provide better patient QOL. However, we found no studies in the literature that correlated overall health status with the other functional scales and symptoms assessed through questionnaires.

## Conclusion

Most patients submitted to TME have a satisfactory quality of life one year after the surgery, although there were differences between the genders.

The patient's age and the performance of preoperative radiotherapy influence the risk of worsening of sexual function and urinary disorders and increased bowel movement problems. The postoperative time and the distance from the anastomosis to the anal verge did not significantly influence the QoL of assessed patients. The main items that positively influenced the overall health status were physical function, social and emotional function, fatigue, future prospects, gastrointestinal symptoms and bowel movement disorders.

## Conflict of interest

The authors declare no conflicts of interest.

## REFERENCES

- Sideris L, Zenasni F, Vernerey D, Dauchy S, Lasser P, Pigon JP, et al. Quality of life of patients operated on for low rectal cancer: impact of the type of surgery and patients characteristics. *Dis Colon Rectum* 2005;48:2180-91.
- Aaronson NK, Ahmedzai S, Bergman B, Bullinger M, Cull A, Duez NJ, et al. The European Organization for Research and Treatment of Cancer QLQ-C30: a quality-of-life instrument for use in international clinical trials in oncology. *J Natl Cancer Inst* 1993;85:365-76.
- Fayers P, Aaronson N, Bjordal K. On behalf of the EORTC Quality of Life Study Group. *QLQ-C30 Scoring Manual*, 1st ed. Brussels: 1995.
- Cull AM. Cancer-specific quality of life questionnaires: the state of the art in Europe. *Eur J Cancer* 1997; 33: S3-7.
- Sprangers MA, teVelde 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;35:238-47.
- Maisey NR, Norman A, Watson M, Allen MJ, Hill ME, Cunningham D. Baseline quality of life predicts survival with advanced colorectal cancer. *Eur J Cancer* 2002; 38:1351-57.
- Engel J, Kerr J, Schlesinger-Raab A, Eckel R, Sauer H, Hölzel D. Comparison of breast and rectal cancer patient's quality of life: Results of a four year prospective field study. *Eur J Cancer Care* 2003;12:215-23.
- Limpert P, Longo WE, Kelemen PR, Vernava AM, Bahadursingh AN, Johnson FE, et al. Colon and rectal cancer in the elderly: high incidence of asymptomatic disease, less surgical emergencies, and a favorable short-term outcome. *Crit Rev Oncol Hematol* 2003;48:159-63.
- Nicolussi AC, Sawada NO. Qualidade de vida de pacientes com câncer colorretal em terapia adjuvante. *Acta Paul Enferm* 2009;22:155-61.
- Schmidt CE, Bestmann B, Küchler T, Longo WE, Rohde V, Kremer B. Gender differences in quality of life of patients with rectal cancer. A five-year prospective study. *World J Surg* 2005;29:1630-41.
- Fleishman JA, Lawrence WF. Demographic variation in SF-12 scores: true differences or differential item functioning? *Med Care* 2003;41(7 Suppl):III75-III86.
- Schmidt CE, Bestmann B, Küchler T, Longo WE, Kremer B. Ten-year historic cohort of quality of life and sexuality in patients with rectal cancer. *Dis Colon Rectum* 2005;48:483-92.
- Camilleri-Brennan J, Steele RJ. Objective assessment of morbidity and quality of life after surgery for low rectal cancer. *Colorectal Dis* 2002;4:61-66.
- Enker WE. Potency, cure, and local control in the operative treatment of rectal cancer. *Arch Surg* 1992;127:1396-402.
- Mannaerts GH, Schijven MP, Hendriks A, Martijn H, Rutten HJ, Wiggers T. Urologic and sexual morbidity following multimodality treatment for locally advanced primary and locally recurrent rectal cancer. *Eur J Surg Oncol* 2001;27: 65-72.
- Holm T, Singnomkloa T, Rutquist LE, Cedermak B. Adjuvant pre-operative radiot herapy in patients with rectal carcinoma. Adverse effects during long term follow up of two randomized trials. *Cancer* 1996;78:968-76.
- White CA, Hunt JC. Psychological factors in postoperative adjustment to stoma surgery. *Ann R Coll Surg Engl* 1997;79:3-7.
- Dibble SL, Padilla GV, Dodd MJ, Miaskowski C. Gender differences in the dimensions of quality of life. *Oncol Nurs Forum* 1998;25:577-83.
- Schmidt CE, Bestmann B, Küchler T, Longo WE, Kremer B. Impact of Age on Quality of Life in Patients with Rectal Cancer. *World J Surg* 2005;29:190-7.
- Havenga K, Enker WE, McDermott K, Cohen AM, Minsky BD, Guillem J. Male and female sexual and urinary function after total mesorectal excision with autonomic nerve preservation for carcinoma of the rectum. *J Am Coll Surg* 1996;182:495-502.
- Mastracci TM, Hendren S, O'Connor BO, McLeod RS. The impact of surgery for colorectal cancer on quality of life and functional status in the elderly. *Dis Colon Rectum* 2006;49:1878-84.
- Gordon PH, Schouten WR. Fecal incontinence. In: **Nivatvongs S, Gordon PH.** Principles and practice of surgery for the colon, rectum and anus. 2nd ed. New York: Informa Healthcare; 2007. 293-331.
- Dahlberg M, Glimelius B, Graf W, Pählman L. Preoperative irradiation affects functional results after surgery for rectal cancer: results from a randomized study. *Dis Colon Rectum* 1998;41:543-49.
- Zieren HU, Jacobi CA, Zieren J, Müller JM. Quality of life following resection of esophageal carcinoma. *Br J Surg* 1996;83:1772-75.
- Camilleri-Brennan J, Steele RJC. Prospective analysis of quality of life and survival following mesorectal excision for rectal cancer. *Br J Surg* 2001;88:1617-22.
- Camilleri-Brennan J, Steele RJ. Quality of life after treatment for rectal cancer. *Br J Surg* 1998;85:1036-43.
- Sailer M, Fuchs KH, Fein M, Thiede A. Randomized clinical trial comparing quality of life after straight and pouch coloanal reconstruction. *Br J Surg* 2002; 89:1108-17.
- Jehle EC, Haehnel T, Starlinger MJ, Becker HD. Level of the anastomosis does not influence functional outcome after anterior rectal resection for rectal cancer. *Am J Surg* 1995;169:147-52.
- Guren MG, Eriksen MT, Wiig JN, Carlsen E, Nesbakken A, Sigurdsson HK, et al. Quality of life and functional outcome following anterior or abdominoperineal resection for rectal cancer. *Eur J Surg Oncol* 2005;31:735-42.
- Montesani C, Pronio A, Santella S, Boschetto A, Aguzzi D, Pirozzi R, et al. Rectal cancer surgery with sphincter preservation: functional results related to the level

- of anastomosis. Clinical and instrumental study. *Hepatogastroenterology* 2004; 51:718-21.
31. Seow-Choen F, Goh HS. Prospective randomized trial comparing J colonic pouch-anal anastomosis and straight coloanal reconstruction. *Br J Surg* 1995; 82: 608-10.
  32. Hallbook O, Pahlman L, Krog M, Wexner SD, Sjö Dahl R. Randomized comparison of straight and colonic J pouch anastomosis after low anterior resection. *Ann Surg* 1996; 224:58-65.
  33. Lazorthes F, Chiotasso P, Gamagami RA, Istvan G, Chevreau P. Late clinical outcome in a randomized prospective comparison of colonic J pouch and straight coloanal anastomosis. *Br J Surg* 1997;84:1449-51.
  34. Emmertsen K, Laurberg S. Low anterior resection syndrome score -Development and validation of a symptom-based scoring system for bowel dysfunction after low anterior resection for rectal cancer. *Ann Surg* 2012;255:922-28.