



Is my life going to change?—a review of quality of life after rectal resection

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Abstract: Rectal resection is a common practice for colorectal surgeons. The causes of this procedure are varied. The most frequent is cancer, but also inflammatory bowel disease, endometriosis, and rectovaginal or rectourethral fistulas. The loss of the normal rectal reservoir function, urinary problems, sexual dysfunction or pelvic pain are frequently reported in patients after rectal surgery and these disorders markedly affect the overall quality of life (QoL). In the last decades, rectal surgery has radically changed, with the development of surgical techniques, and it has progressed from abdominoperineal resection (APR) with a permanent colostomy to sphincter-saving procedures. Nowadays, the use of sphincter-preserving surgery has increased, but all these surgical techniques can have important sequels that modify the QoL of the patients. Historically, surgical outcomes, such as complications, survival and recurrences, have been widely studied by surgeons. In the present day, surgical outcomes have improved, rectal cancer recurrence rate has decreased and survival has increased. For these reasons, it has begun to gain importance in aspects of the QoL of patients, such as body image, fecal continence and sexuality or urinary function. Therefore, physicians should know the influence of different techniques and approaches on functional outcomes and QoL, to be able to inform patients of the treatment benefits and risk of postoperative dysfunctions. The aim of our study is to review the current literature to determine to what degree the QoL of patients who underwent a rectal resection decreases, which domains are the most affected and, in addition, to establish the influence of different surgical techniques and approaches on functional outcomes.

Keywords: Quality of life (QoL); rectal cancer; bowel dysfunction; health status

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Introduction

Rectal resection is a common procedure for colorectal surgeons. The most frequent causes of rectal resection are cancer, inflammatory bowel disease, endometriosis, and rectovaginal or rectourethral fistulas, among which, rectal cancer is the most common. The incidence of colorectal

carcinoma is high in the western world, probably due to differences in environment and diet, where it is the second cause of cancer death and the fourth worldwide (1). It affects men and women almost equally. Approximately one million new cases and 250,000 deaths occur each year worldwide (2).

In the last decades, rectal surgery has radically changed

with the development of surgical techniques, and it has progressed from abdominoperineal resection (APR) with a permanent colostomy to the total mesorectal excision (TME) and sphincter-saving surgery (3). The use of sphincter-preserving procedures has increased and includes anterior resection, low anterior resection (LAR), ultra-LAR and intersphincteric resection (ISR). A study from Abraham *et al.* (4) reported a 10% decrease in the use of APR over time from 1989 to 2001. All these surgical techniques can lead to important sequels that modify the quality of life (QoL) of patients. Historically, surgical outcomes, such as complications, survival and recurrences, have been widely studied by surgeons. In the present day, surgical outcomes have improved, rectal cancer recurrence rate has decreased and survival has increased. For these reasons, QoL aspects of patient outcome have become important. Since an increase in survival is expected in the future, physicians have to include QoL aspects to a greater extent into their treatment recommendations (5).

Symptoms reported after resection of the rectum are very varied and include pelvic pain, defecatory, sexual or urinary dysfunctions. Defecatory dysfunctions, which vary from daily episodes of incontinence to obstructed defecation and constipation, are reported in up to 90% of patients after LAR for rectal cancer (6). After treatment, up to 30–40% of survivors may discontinue sexual activity and high percentages ranging from 23–69% of men and from 19–62% of women may experience new sexual dysfunction (7–9). As a consequence, nowadays there is a trend towards organ preservation in rectal cancer whenever possible, including watch and wait strategies in case of complete response to neoadjuvant therapies (10).

The aim of our study is to review the current literature to determine to what degree the QoL of patients who underwent a rectal resection decreases, which domains are the most affected and, in addition, to establish the influence of different surgical techniques and approaches on functional outcomes.

Materials and methods

Literature was searched in Cochrane Library databases, MEDLINE, PubMed, and EMBASE using the following keywords: quality of life, HRQoL, health status, rectal cancer, rectal cancer surgery, abdominoperineal resection, anterior resection, sphincter-saving surgery, ultralow anterior resections, total mesorectal excision, transanal TME. Additional searches were developed through the

terms: low anterior resection syndrome, bowel dysfunction, incontinence, fecal incontinence, functional outcome, stoma. papers which included only adult patients were selected. The website of the World Health Organization has also been consulted. The bibliographic search was carried out by a single researcher. The review of the selected documents and the inclusion decision was made by all the researchers.

Global QoL

In recent years, aspects of QoL have been gaining importance within Medicine. Nevertheless, there is no consensus on the definition of this concept. World Health Organization defines QoL as: “An individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person’s physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment” (11). On the other hand, Koller *et al.* (12) define QoL as: “an individual sense of well being in the somatic, emotional and social domains”. Most studies measure the QoL using the Short Form 36 health survey and the European Organization for Research and Treatment of Cancer (EORTC) QoL Questionnaires. Among which, the most frequent are quality-of-life questionnaire CR29, quality-of-life questionnaire C30 and quality-of-life questionnaire CR38 (13–16).

In general terms, no differences were found between rectal cancer patients and general population on global health status (17). It is striking that in some studies the perception of well-being and some subscales of instruments were even better with respect to normal data (17–19). The relatively high QoL might be explained by the fact that the measurement followed their earlier diagnosis of a life-threatening disease, which changed their perceptions of the length of life, thereby shifting their expectations and priorities regarding life fulfilment. Successful treatment therefore might result in a higher QoL as reported by the patient (17,20,21). This effect, known as Rejoice, has been noted from the beginning of QoL research (22). An additional contributing factor might be the adaptation of the patients to their morbidity over time, a phenomenon that is also referred to as coping or “response shift” (20). Adaptation is defined as a change in the meaning of a respondent’s self-evaluation of QoL that results from

changes in his or her internal standards, values, or conceptualization of QoL (20,23). Another explanation is that traumatic events seem to produce positive effects, increasing life appreciation, improving relationships with family and friends, changing the life priorities, increasing spirituality, and feeling stronger and more compassionate (17). Although the global health score is not different between rectal cancer patients and general population, there are other QoL domains that are worse in patients with rectal cancer. Thus, these patients have lower social-, physical-, role- and cognitive functioning, and more diarrhea, constipation, insomnia and fatigue (17,24).

According to Choy *et al.* (25) QoL suffers an important reduction in the immediate postoperative period after pelvic exenteration, with a rapid improvement in the first 3 months after hospital discharge and later a slower improvement during the first year after surgery. This study describes that patients reach, a year after surgery, QoL scores similar to the preoperative ones. However, despite the general tendency to improvement with follow-up, a small reduction in overall functioning is still present even 14 years after treatment for rectal cancer (26).

On the other hand, several studies found that patients feel uncertain after surgery and would like to receive more information (27-29). Furthermore, some patients have excessive concern in a normal postoperative period. Nevertheless, other patients suffer many complaints that they consider normal. Both situations can cause an unnecessary stress that deteriorates QoL (29). A Swedish study confirmed that a large proportion of patients experienced negative intrusive thoughts and this produces a decrease in overall QoL (30). Also, Wrenn *et al.* (31) showed that QoL factors traditionally considered most important to surgeons, such as incision length, hospital length of stay, and use of laparoscopy, were not the most valued from the patient's perspective. The aspects that mattered most to patients were whether they would be cured of cancer and avoiding a permanent stoma. For these reasons, preoperative and postoperative counseling is very important and providing proper information and details can reduce the patient's anxiety, which will result in a better perception of QoL.

Regarding gender, Schmidt *et al.* (32) found differences between men and women. Specifically, women had worse pre- and postoperative functional status and more fatigue and sleep disturbance than men. Insomnia is a common problem among patients surviving cancer surgery because they have a constant fear of tumor recurrence (33). This

aspect can be reduced by providing detailed information and adequate support to patients (34).

It is important to mention that preoperative radio(chemo)therapy negatively influence on functional outcomes and the adverse effects may occur with a latency of several months or even years. Accordingly, preoperative radio(chemo)therapy sequelae may not be displayed in studies with short follow-ups (35). Additionally, adjuvant chemotherapy also affects the QoL scores. Van der Valk *et al.* (36) described worse overall QoL, worse physical functioning, more fatigue and dyspnea for patients treated with adjuvant chemotherapy compared with those not receiving chemotherapy treatment. However, all these differences disappeared 12 months after surgery.

Bowel dysfunction

In rectal surgery, loss of the normal rectal reservoir function can lead to a postoperative defecation disorder named anterior resection syndrome (ARS), and may seriously affect QoL (37-39). Physical activities, work, hobbies, family and social activities can be affected by the symptoms of ARS (17). ARS has a negative impact on patient QoL in up to 80% and is frequently underestimated by surgeons (39). Symptoms of this syndrome include incontinence (3-79%), urgency (0-69%), pad usage (6-65%), clustering of bowel movement (6-88%), inability to differentiate gas from stool (2-62%), incomplete evacuation (2-85%), nocturnal bowel movement (14-27%) and 4+ bowel movement/day (10-60%) (40). ARS is reported in 50-90% of patients (41). Usually, bowel dysfunction stabilizes within the first 1-2 years after surgery (42). Long term follow-up studies showed that the symptoms present 1 year after surgery remain the same in the following years. It has been reported that 47.5% of patients still experience ARS symptoms at a follow-up period of 13.7 years (43,44). There are validated scales to measure the severity of ARS and with them it is possible to differentiate between major ARS, identified in 36.9% of patients, and minor ARS in 33.9% of patients (41). *Table 1* shows the incidence of ARS. Some studies have found an association between bowel intestinal dysfunction and QoL. In them, there were differences between the major ARS and no ARS groups, and between the major ARS and minor ARS groups, but not between the no ARS and minor ARS groups (45).

Kornmann *et al.* (47) concluded that elderly females had worse QoL scores in terms of coping/behavior and

Table 1 Incidence of ARS

Study	n	Major ARS	Minor ARS	No ARS
Ihnát <i>et al.</i> (41)	65	36.9%	33.9%	29.2%
Ribas <i>et al.</i> (42)	70	54.3%	15.7%	30%
Sturiale <i>et al.</i> (43)	93	20.5%	27%	52.5%
Chen <i>et al.</i> (45)	242	46%	22%	32%
Bregendahl <i>et al.</i> (46)	938	41%	23.5%	35.5%

ARS, anterior syndrome resection; n, patients included in study.

depression/self-perception compared with males and younger females. Similarly, Sturiale *et al.* (43) analysis established that age is a risk factor for ARS in patients older than 65. Fecal incontinence is more frequent in females (48). This may be due to traumatic injuries to the anal sphincter complex and pelvic floor in vaginal deliveries. Also, the female gender has a predisposition for fecal incontinence, due to age-related changes in the function of the anal sphincter (47).

Another risk factor of anal dysfunctions is radiation therapy, administered pre- or postoperatively (46,49). Moreover, neoadjuvant treatment is a risk factor for ARS after long-term follow-up (43,49). These disturbances are due to fibrosis in the anal sphincters and possible adverse effects of radiotherapy on sacral nerves (49). Nevertheless, Pietrzak *et al.* (50) reported no significant difference between short-course radiotherapy and long-course chemoradiotherapy with regard to function after a median follow-up of 13 months.

The location of the rectal lesion determines a total (TME) or partial mesorectal excision (PME). After rectal resection, high or low anastomosis can be performed. TME has been shown to be a risk factor for ARS, which has consequences on the patient's QoL (46). In the same way, a worse functional outcome in low anastomosis have been reported (51). The construction of neorectal reservoir during reconstruction in rectal surgery can improve functional outcomes (52-55). There are different reconstructive techniques such as colonic J pouch, side-to-end coloanal anastomosis or transverse colectomy. However, recent studies showed that colonic J-pouch and side-to-end coloanal anastomosis or transverse colectomy lead to a better functional outcome than straight coloanal anastomosis for the first year after surgery, but after 24 months the function is similar regardless of the type of reconstruction (49,56,57). On the other hand, anastomotic leakage is associated with

increased morbidity and mortality, but the relationship of this complication with the presence of bowel dysfunction is controversial (46). Some studies have reported an increased risk dysfunction after anastomotic leakage (58), while others have not confirmed this fact (59,60).

Diverting stoma?

Performing a diverting stoma reduces the rate of reoperation after anastomotic leakage, but does not reduce its incidence (60). We must also take into account that a loop ileostomy can produce alteration of body anatomy, peristomal dermatitis, diarrhea, dehydration or psychological impact (61). According to the literature, a diverting stoma produces a reduction in QoL before reversal, with decreased social and physical function (61-63). Sometimes the ileostomy cannot be reversed, so it becomes a permanent stoma. Näsvalld *et al.* (64) found a decrease in overall QoL, in physical role functioning and lower perception of body image in patients operated for rectal cancer with permanent stoma compared to patients without permanent stoma. Also, they reported more fatigue and loss of appetite in the stoma group.

Permanent stoma or sphincter preserving surgery?

Classically, the standard surgical technique for rectal cancer was the APR or the anterior resection with terminal colostomy. As a result, patients required permanent stomas. Nevertheless, in the last decades, the development of surgical techniques has allowed us to perform sphincter-preserving resection for rectal cancer, such as LAR or ISR. With these, rates of permanent stoma have decreased. Many studies have compared the QoL between APR and sphincter-preserving resection. Surprisingly, in most studies

Table 2 Mean scores for QoL areas in the EORTC QLQ-C30 general questionnaire for LAR and APR groups at 1 year of follow-up. A higher score indicates better QoL

Scores	Arraras <i>et al.</i> (67)		Grumann <i>et al.</i> (69)		Du <i>et al.</i> (72)	
	LAR	APR	LAR	APR	LAR	APR
Global QoL	70.9	71.8	69.44	74.21	75.85	70.75
Physical functioning	87.8	78.4	83.56	90.48	79.90	73.70
Role functioning	87.2	78.3	74.44	88.10	76.05	75.70
Emotional functioning	81.8	88.5	72.41	77.38	83.10	76.47
Cognitive functioning	87.8	88.9	85.19	92.06	77.40	78.20
Social functioning	83.9	81.7	78.89	82.54	80.80	75.16
Body image	85.4	92.1	76.05	74.07	86.45	79.85

QoL, quality of life; LAR, low anterior resection; APR, abdominoperineal resection.

no differences in global QoL have been found between the two groups (20,65-68). However, Grumann *et al.* (69) and Feddern *et al.* (70) showed that LAR patients experienced a worse QoL than APR patients. In contrast, Engel *et al.* (71) and Du *et al.* (72) observed that APR patients had a lower QoL. Furthermore, Monastyrska *et al.* (73) described a significant difference in QoL assessment prior to and after surgery in each group, but 6 months after the procedure, no differences were found between both groups. *Table 2* shows the QoL scores in patient groups (LAR and APR) one year after treatment.

Some studies confirm worse physical function of patients after APR (65,73,74). On the other hand, there are studies found that patients after LAR scored higher in emotional and cognitive functioning (18,73), but other studies reported that patients undergoing LAR presented significantly worse cognitive and social function (75). We must take into account that patients after stoma formation may experience difficulties accepting their own bodies. There are studies that found a worse perception of body image in patients after APR compared with patients undergoing to sphincter-preserving procedures (20,66). Conversely, in other studies, the perception of body image of APR patients was similar to those of LAR patients (67,73).

Within sphincter-preserving procedures, one severe adverse effect is the intestinal disorders. Generally, a higher fecal incontinence scoring, frequent defecation and urgency have been described in the literature in patients undergoing LAR or ISR compared to patients after APR (65,67,73). Trenti *et al.* (66) reported that after sphincter saving procedure, 62% of the patients presented a major ARS that impaired global QoL. Moreover, patients with

high anastomosis have a higher risk of developing ARS than patients with low anastomosis (65). These problems can be the explanation that the global QoL is not different between APR and LAR.

Open, laparoscopic, transanal or robotic?

Open surgery has been the conventional technique for the treatment of rectal cancer until the appearance of laparoscopic surgery. In comparison with open approach, minimally invasive techniques are associated with favorable short-term outcomes, such as reduced blood loss, reduced pain and shorter hospital stay (76). However, there are no differences regarding oncological outcomes or effects on QoL between either approach (77-79). Some studies showed that patients operated for rectal cancer with laparoscopic sphincter preservation were associated with a better QoL, fewer male sexual problems, better physical functioning, less micturition and gastrointestinal problems, when compared to the open approach in the first months after surgery, but the benefit disappeared after one year. In addition, transient benefits of QoL were reported, in terms of global health status, pain, and body imaging (80-85). In contrast, Jayne *et al.* (86) showed a higher rate of sexual dysfunction in laparoscopic surgery. On the other hand, the CLASICC trial (87) and Scarpa *et al.* (88) reported similar QoL results between laparoscopic and open surgery, particularly in the long-term follow-up. Some differences in QoL scores between laparoscopic and open approaches are presented in *Table 3*.

An innovative technique developed to reduce the unwanted effects of open surgery as well as improve the

Table 3 Comparison of QoL scores between the laparoscopic and open techniques. A higher score indicates better QoL

Scores	Ng <i>et al.</i> (80)		Braga <i>et al.</i> (81)		Scarpa <i>et al.</i> (88)	
	LAP	OPEN	LAP	OPEN	LAP	OPEN
Global QoL	71.1	61.0	74	65	92	86
Physical functioning	87.1	81.3	78	63	95	90
Social functioning	76.5	62.7	74	63	87	100

QoL, quality of life; LAP, laparoscopic surgery; OPEN, open surgery.

technical advantages of laparoscopic surgery is the robot, based on the use of instruments that allow 360° movement, tremor elimination and a three-dimensional vision. For these reasons, using this approach in the narrow pelvis could be beneficial, since a precise TME reduces local recurrence rates (89,90). Kamali *et al.* (33) showed less postoperative pain after robotic surgery compared to the laparoscopic approach despite having a shorter follow-up. A systematic review and meta-analysis by Broholm *et al.* (91) demonstrated a lower incidence of sexual dysfunction in the robotic approach compared to laparoscopy. In the same way, Kim *et al.* (92) concluded that the robotic approach was associated with less impairment of urinary and sexual function, but the QoL was comparable in both groups.

Recently, transanal total mesorectal excision technique (TaTME) has appeared and some published studies have showed that it is a safe alternative to laparoscopic TME for middle and low rectal cancer. TaTME allows a precise dissection of the mesorectal plane, due to the improved vision by transanal approach, which entails potential short-term clinical advantages, such as lower conversion rate, lower leak rate, and slightly lower short-term morbidity (93-95). Literature regarding QoL in TaTME procedures is scarce. A comparative study between laparoscopic surgery and transanal approach, showed a significant difference between the two groups in terms of fecal incontinence scored by a single item regarding leakage of stools, favoring the laparoscopic group. Moreover, there were significant differences in QoL favoring the laparoscopic approach to TME in terms of role functioning, fatigue, and financial difficulties (96). However, Pontallier *et al.* (97) showed better erectile function in the transanal group compared to conventional laparoscopy. Similarly, in the study by Bjoern *et al.* (98), TaTME had better scores on the reported QoL, related to urinary symptoms. We need further prospective studies to establish the potential impact of TaTME procedures in QoL.

Urinary dysfunction

Usually, urinary problems after rectal resection are less frequent and less severe than bowel dysfunction, but its presence can deteriorate patient's QoL. Wani *et al.* (20) reported that 19% of patients suffered from post-operative urinary dysfunction and were more frequently observed after APR than after LAR. Nevertheless, other studies did not find differences between surgical techniques (63,65,99). Radiotherapy, tumor size, intra-abdominal sepsis, and age older than 65 years have been associated with voiding dysfunction disorders after rectal cancer excision (100-102). Moreover, in the surgical procedure the pelvic floor innervation can be injured, which can produce micturition dysfunction. An increasing risk has also been detected with preoperative blood loss, preoperative difficulty in bladder emptying and autonomic nerve damage (103,104).

In some studies, a higher incidence of micturition problems was observed after APR than LAR (20). In contrast, other reports observed that urinary disturbances were comparable in the two groups (65).

Sexual dysfunction

The term sexual dysfunction refers to a set of symptoms, among which are included impotency, inability to ejaculate, erectile dysfunction, lack of sexual desire or dyspareunia, and are frequently reported in rectal cancer patients (24,63,105). These problems appear after rectal resection in 11% to 27% of patients. Young patients are more affected by sexual problems than the elderly (105,106). Thyø *et al.* (105) have found differences in overall QoL between patients with sexual dysfunction and patients without sexual dysfunction, comparing the score with EORTC QoL data. The sexual impairment may be due to autonomic pelvic nerve injury or, indirectly, by vascular damage, produced by radiotherapy or by surgery. Further, psychological factors can also influence in these disorders (17,24,63). In the same

way, it has been reported that female sexual function and capability to become sexually aroused is complex and can easily be inhibited by negative influences such as pain (105). Konanz *et al.* (65) have found a markedly worse sexual function in patients after APR, compared to after ISR or LAR. For this reason, a good strategy could be reversing a diverting stoma as soon as possible. A study published in 2017 indicated that a low coloanal anastomosis might cause more sexual problems with negative impact on sexual functioning according to the EORTC quality-of-life questionnaire CR38 scores in the group without a stoma, but also the appearance of a parastomal hernia or bulge around the stoma significantly impaired sexual functioning and enjoyment (64).

Conclusions and future perspectives

Patients undergoing rectal resection, particularly those with neoadjuvant treatment, may see their QoL affected. For this reason, patients should be informed of the treatment benefits and risk of postoperative dysfunctions. In the same way, treatment decisions must be based on both the patient preferences and clinical judgment. The management of these patients should be multidisciplinary to ensure that after treatment they should have an optimal QoL.

In the next years, this field of study would benefit from: an increase in the number of methodologically studies comparing patients with the general population at multiple assessment times; the development of instruments that are able to seize the specific symptomatology of rectal cancer and to assess its impact of patients' QoL; and widening the collection of reference data for generic questionnaires as well as starting to collect normative data for specific questionnaires, reporting details about the sample drawn from the general population.

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Footnote

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