

Quality of Life After Laparoscopic Colectomy for Cancer

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ABSTRACT

Background and Objectives: This review focuses on health-related quality-of-life (HRQoL) assessment questionnaires and the influence of various parameters on HRQoL at distinct time points after laparoscopic colectomy for cancer.

Methods: A PubMed electronic database literature search was conducted.

Results: Twenty studies (7 prospective randomized, 5 nonrandomized, 2 retrospective, 1 matched, and 3 observational studies) used the following HRQoL tools: European Organisation for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ)-C30 (8 studies), EORTC QLQ-CR38 (6 studies), EORTC QLQ-CR29 (1 study), Short Form 36 (8 studies), Gastrointestinal Quality Life Index (2 studies), EuroQoL-5D (1 study), Symptoms Distress Scale (2 studies), Quality of Life Index (2 studies), and global quality of life (1 study). Long-term beneficial effects on patient HRQoL after laparoscopic colectomy for cancer have not been clearly shown compared with “open” resections. A physical function deterioration and emotional function improvement are observed during the first month. Most patients have recovered at 12 months. Distinct HRQoL domains may be affected in older, female, and chemotherapy-treated patients. HRQoL-related parameters of pain and cosmesis have been assessed in few of the current studies on hand-assisted and single-incision laparoscopic colectomy.

Conclusion: Studies’ heterogeneity in terms of assessment tools and time points remains as the main obstacle to establish robust conclusions. The addition of more pa-

tients and extension of the follow-up period will improve our knowledge on HRQoL changes after laparoscopic colectomy for cancer.

Key Words: Colorectal cancer, Laparoscopy, Health-related quality of life, EORTC QLQ-C30, SF-36, Laparoscopic colectomy.

INTRODUCTION

Colorectal cancer continues to be the third most common cancer in Western countries, and surgery remains the main modality for eradication of the disease.¹ Instrumental and technologic advances have pushed forward clinical studies evaluating the role of minimally traumatic surgery on the management of colorectal cancer.^{2,3} Earlier concerns about the oncologic safety of laparoscopic surgery have been dispelled by large randomized trials indicating the noninferiority of the laparoscopic technique for colon cancer in terms of survival and recurrence.⁴⁻⁷ In addition, a variety of studies have reported that laparoscopic colorectal resections provide a shorter hospital stay, a quicker return to normal activities, and less postoperative pain.⁸⁻¹⁰

Earlier detection and improvements in treatment have resulted in declination of the mortality rates for both colon and rectal cancer.¹¹ Therefore more patients may live longer, though suffering the consequences of the disease, such as bowel dysfunction, pain, fatigue, and psychological distress. Patients’ benefits in terms of health-related quality of life (HRQoL) have arisen as an important surgical outcome measure.¹²⁻¹⁴ The unavoidable anatomic distortion of the bowel anatomy from resections and the biochemical effects of adjuvant treatments for colorectal cancer may lead to HRQoL physical and functional alterations. Patients wish to be prepared for what is expected postoperatively, and those who choose laparoscopic colectomy for treatment of their cancer may be more motivated and better informed at various aspects of treatment and recovery stages.

Information regarding HRQoL after laparoscopic colectomy for malignancy is mainly derived by the ample bibliographic evidence of its comparison with the conven-

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tional, “open” counterpart.^{15,16} Rather limited data exist in the literature focusing on the isolated and targeted longitudinal analysis of HRQoL changes and related affecting parameters after laparoscopic colorectal cancer resection.^{17,18} Previous reports have concluded that further research is required because of lack of sufficient data.^{19,20} Beyond the scope of only evaluating any advantages or disadvantages of one approach over the other, this review focuses on the various assessment tools and validated questionnaires used to measure HRQoL after laparoscopic colectomy for cancer, as well as analyzing the influence of laparoscopic treatment and various influencing parameters at distinct postoperative time points of patients' evaluation.

METHODS

Search Strategy

A literature search of the PubMed electronic database was conducted using the following as key words: laparoscopy, colectomy, laparoscopic colectomy, colon cancer, rectal cancer, colorectal cancer, health-related quality of life, and quality of life. All studies using HRQoL as a primary or secondary endpoint or analyzing laparoscopic colectomy for cancer with any reference to HRQoL or any of its specific domains were included. Studies containing data on HRQoL or evaluating the change in HRQoL during the time after laparoscopic colectomy for colon cancer were categorized as randomized clinical trials (RCTs) comparing laparoscopic and open colectomy for cancer, nonrandomized prospective comparative (NRPC) studies, retrospective comparative studies, retrospective matched comparative studies, and observational prospective (OP) studies. The results of each study were extracted based on the following format: methodologic aspects of the study, inclusion and exclusion criteria, HRQoL instruments, time intervals of HRQoL assessment, and results.

A separate similar electronic search was run for “hand-assisted laparoscopic colectomy” (HALC) and “single-incision laparoscopic colectomy” (SILC) for cancer.

HRQoL Measurement Tools

The following validated HRQoL measurement tools have been used in the retrieved “laparoscopic colectomy for cancer” studies: European Organisation for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ)-C30, EORTC QLQ-CR38, EORTC QLQ-CR29, Gastrointestinal Quality Life Index, Short Form 36 (SF-36),

EuroQoL-5D, Symptoms Distress Scale (SDS), Quality of Life Index (QLI), and global quality of life (QoL). Domains, scales, and scoring calculations of the questionnaires have been extensively reported previously.^{16,21–26} Selected studies used either their own constructed or not widely validated questionnaires, such as visual analog scales for pain while coughing, for fatigue, and at rest^{27,28}; the German self-report inventory BSKE (Befindlichkeitsskalierung anhand von Kategorien und Eigenschaftswörtern) by Janke, Hüppe, and Erdmann analyzing the results with respect to the two dimensions: positive mood and negative mood²⁹; the German versions of the QoL questionnaire (Short Form 12) and the Brief Symptom Inventory²⁹; and the body image questionnaire.³⁰

RESULTS

Description of Trials

Twenty studies reporting on HRQoL after laparoscopic colectomy for cancer were included in this analysis and are presented in **Table 1**. Among them, 9 publications analyzed results from 7 RCTs,^{10,15–17,28,31–33,39} 5 were NRPC studies,^{29,34–36,38} 2 were retrospective comparative studies,^{27,37} 1 was a retrospective matched comparative study,³⁰ and 3 were OP studies.^{18,40,41} Regarding the RCTs, HRQoL was a primary outcome measure in 6 trials. The following validated questionnaires were used for measuring HRQoL: EORTC QLQ-C30 (8 studies), SF-36 (8 studies), EORTC QLQ-CR38 (1 study), SDS (2 studies), QLI (2 studies), Gastrointestinal Quality Life Index (2 studies), global QoL (1 study), EORTC QLQ-CR29 (1 study), and EuroQoL-5D (1 study).

Only two HRQoL-related domains have been reported in studies referring to results after HALC or SILC for colorectal cancer: pain, assessed by visual analog scale (VAS) score,^{42–49} and cosmesis, assessed by the body image questionnaire and a cosmetic scale.⁴⁹

Assessment of HRQoL After Laparoscopic Colectomy

HRQoL in first month. In their retrospective study of 113 patients, Adachi et al²⁷ reported that patients after laparoscopic colectomy described a significantly better mood during the first postoperative days (PODs) compared with patients after open colectomy, whereas these differences declined up to the fourth POD. The postoperative measurement of the patients' emotional state with the BSKE in the small-sized study by Gameiro et al²⁹

Table 1. Summary of Studies Referring to HRQoL After Laparoscopic Colectomy for Cancer

Authors	Type of Study	No. of Patients		Type of Cancer	Conversion Rate	HRQoL Measures	Assessment Time Points
		Lap ^a	Open ^a				
Psaila et al, ³⁵ 1998	Nonrandomized comparative	25	29	Colorectal cancer	12%	SF-36 ^a	Baseline, 2 and 4 mo
Schwenk et al, ²⁸ 1998	Randomized clinical trial	30	30	Colorectal cancer	3.3%	PCA ^a , VASC ^a , VASFI ^a , VASR ^a	First POD–fourth POD ^a
Weeks et al, ¹⁶ 2002	Randomized clinical trial	228	221	Colon cancer	25.7%	QLI ^a , SDS ^a , global QoL	Baseline, second POD, 2 wk, 8 wk
Adachi et al, ²⁷ 2003	Retrospective comparative	26	87	Colon cancer	NR ^a	9-item questionnaire	1 y
Sokolovic et al, ³⁷ 2004	Retrospective comparative	196	131	Colon cancer	NR	SF-36	2–3.5 y
Guillou et al, ³³ 2005	Randomized clinical trial	526	268	Colorectal cancer	29%	EORTC QLQ-C30, EORTC QLQ-CR38	Baseline, 2 and 12 wk
Yang et al, ³⁶ 2007	Nonrandomized comparative	125	103	Low rectal cancer	NR	EORTC QLQ-C30, EORTC QLQ-CR38	Baseline, 3–6 mo, 12–18 mo, 2–5 y
Breukink et al, ¹⁸ 2007	Observational prospective	51		Rectal cancer	0%	SF-36, EORTC QLQ-C30, EORTC QLQ-CR38	Baseline; 3, 6, and 12 mo
Janson et al, ¹⁵ 2007	Randomized clinical trial	130	155	Colon cancer	17.7%	EORTC QLQ-C30, EQ-5D ^a	2, 4, and 12 wk
Braga et al, ¹⁰ 2007	Randomized clinical trial	83	85	Rectal cancer	0%	SF-36	1, 2, and 4 y
Staudacher et al, ³⁴ 2007	Nonrandomized comparative	108	79	Rectal cancer	12%	SF-36	Baseline, 1 y
Jayne et al, ³¹ 2007	Randomized clinical trial	696 (2:1 randomization)		Colorectal cancer	38% (first year of study), 16% (sixth year of study)	EORTC QLQ-C30, EORTC QLQ-CR38	Baseline; 6, 18, and 36 mo
Gameiro et al, ²⁹ 2008	Nonrandomized comparative	20	22	Colorectal cancer	NR	BSKE ^a , SF-12 ^a , BSI ^a	Second and fourth POD
King et al, ³² 2008	Randomized clinical trial	41	19	Colorectal cancer	NR	EORTC QLQ-C30, EORTC QLQ-CR38	Baseline; 3, 6, and 12 mo
Scarpa et al, ³⁰ 2008	Retrospective matched comparative	21	21	Colorectal cancer	NR	SF-36, BIQ ^a	3 mo
Li et al, ³⁸ 2010	Nonrandomized comparative	11	65	Rectal cancer	16.9%	EORTC QLQ-C30, EORTC QLQ-CR38	Baseline, 1 wk, 3 mo, 12 mo
Stucky et al, ¹⁷ 2011	Randomized clinical trial	230	219	Colon cancer	25.7%	SDS, QLI	Baseline, 2 wk, 2 mo, 18 mo

Table 1. (continued)
Summary of Studies Referring to HRQoL After Laparoscopic Colectomy for Cancer

Authors	Type of Study	No. of Patients		Type of Cancer	Conversion Rate	HRQoL Measures	Assessment Time Points
		Lap ^a	Open ^a				
Vlug et al, ³⁹ 2011	Randomized clinical trial	216	211	Colon cancer	11.5%	SF-36, GIQLI ^b	Baseline, 2 and 4 wk
Ince et al, ⁴¹ 2011	Observational prospective		166	Colorectal cancer, diverticulitis, Crohn disease, ulcerative colitis	NR	SF-36	Baseline, 4 wk
Theodoropoulos et al, ⁴⁰ 2013	Observational prospective		85	Colorectal cancer	NR	SF-36, EORTC QLQ-C30, EORTC QLQ-CR29, GIQLI	Baseline; 1, 3, 6, and 12 mo

Conversion rates refer to patients who underwent laparoscopic colectomy.

BIQ = body image questionnaire; BSKE = Befindlichkeitskalierung anhand von Kategorien und Eigenschaftswörtern; BSI = Brief Symptom Inventory; EQ-5D = EuroQol-5D; GIQLI = Gastrointestinal Quality Life Index; Lap = patients who underwent laparoscopic colectomy; NR = not reported; Open = patients who underwent open colectomy; PCA = patient-controlled analgesia; SF-12 = Short Form 12; VASc = visual analog scale for pain while coughing; VASf = visual analog scale for fatigue; VASr = visual analog score at rest.

showed that the laparoscopic group of patients enjoyed a significantly better positive mood when compared with the open group; no significant group difference was recorded for negative mood. Schwenk et al²⁸ reported that fatigue was significantly less in patients after laparoscopic colectomy compared with conventional colectomy from POD 2 to 7, whereas VAS scores while coughing were higher from POD1 to POD7 among patients having undergone open colectomy. Sex showed minor effects on the estimated VAS pain score while coughing. Li et al,³⁸ in an NRPC trial comparing the impact of laparoscopic and open colectomy for rectal cancer on HRQoL, found that, at the end of the first postoperative week, patients who underwent laparoscopic colectomy continued to exhibit worse HRQoL compared with baseline according to the EORTC QLQ-C30 and QLQ-CR38 questionnaires but they had less pain, better general health, and a better body image compared with those who had undergone open colectomy. On the other hand, according to an RCT by Vlug et al,³⁹ patients presented with worse physical functioning (PF), bodily pain, and social functioning (SF) 2 weeks after surgery but pain and SF returned to baseline values 4 weeks after surgery whereas only PF remained significantly lower. Interestingly, they did not find any difference between the laparoscopic and open approaches.

Analyzing the short-term outcomes of the Clinical Outcomes of Surgical Therapy (COST) study, Weeks et al¹⁶ evaluated the HRQoL of patients after laparoscopic and open colectomy at 2 days, 2 weeks, and 2 months using the SDS, QLI, and global QoL. They concluded that pain was worse 2 days after laparoscopic surgery compared with baseline whereas pain and gastrointestinal symptoms were equal to and better than baseline after 2 weeks and 2 months, respectively. Compared with open colectomy, laparoscopic surgery for colon cancer resulted in statistically significant but clinically modest decreases in the postoperative analgesia and length of hospitalization. These differences, though, did not translate into statistically significant SDS, QLI, or global QoL improvements in the immediate postoperative period (2 days) or over a 2-month follow-up period. However, the global rating scale score for HRQoL at 2 weeks after surgery was significantly better in patients assigned to laparoscopic treatment compared with the open arm. It has to be stressed that 25.7% of the patients assigned to laparoscopic colectomy required conversion to an open procedure. Patients requiring conversion reported poorer HRQoL for all measures at baseline and every follow-up assessment than patients who had their colectomy completed laparoscopically.

Regarding social and role function, Janson et al,¹⁵ using the EORTC QLQ-C30 questionnaire in a subset of the Swedish patients' contribution to the COLOR (Colon Carcinoma Laparoscopic or Open Resection) trial, showed that these measures were significantly better at 2 weeks after laparoscopic colectomy compared with baseline. Consistent with these data, Theodoropoulos et al,⁴⁰ in an OP study, showed that despite patients' deteriorated PF and global health, they had improved emotional function and less anxiety at 1 month after surgery compared with baseline. Finally, Ince et al,⁴¹ in an observational study including benign intestinal disorders (ie, diverticulitis and inflammatory diseases), found that patients who underwent laparoscopic colectomy for cancer had worse PF but similar emotional function compared with baseline. They also showed that cancer is a negative predictor of HRQoL after laparoscopic colectomy. These results suggest that despite patients' physical deterioration, they present with improvement of their mood and emotional status 1 month after surgery.

In the British RCT study entitled "United Kingdom Medical Research Council Conventional Versus Laparoscopic-Assisted Surgery in Colorectal Cancer" (UK MRC CLASICC) trial, Jayne et al³¹ reported increased micturition at 2 weeks, which had been alleviated at 3 months after surgery in both arms (open and laparoscopic). They observed a worse body image than at baseline from 2 weeks onward for all patients. On the other hand, in the same trial, patients had increased pain, fatigue, and appetite loss and more problems in cognitive, role, physical, and social function compared with baseline at 2 weeks after laparoscopic colectomy based on the EORTC QLQ-C30 questionnaire. In contrast, they reported fewer problems with diarrhea 2 weeks postoperatively. HRQoL measurement by the EORTC QLQ-CR38 questionnaire showed increased pain, micturition, mouth dryness, taste alterations, and body dissatisfaction but decreased flatulence and weight loss and less blood in stool samples at 2 weeks after surgery for both arms.³³ Improvement, however, was noted in future prospective and defecation problems for both arms.³¹

Stucky et al¹⁷ proposed that surgical complications were particularly influential on HRQoL in the early postoperative period, especially the first postoperative month. Finally, regarding the factors affecting HRQoL during the first postoperative month after laparoscopic rectal cancer surgery, Breukink et al¹⁸ showed that patients aged >70 years complained of more severe micturition at this time point.

HRQoL at 1 to 3 months. Analysis of results using the SF-36 questionnaire by Psaila et al³⁵ in a nonrandomized comparative study supported the impression that recovery after laparoscopic resection was more rapid. Six of the 8 HRQoL domains were less impaired after laparoscopic compared with open surgery. This trend persisted at both 2 and 4 months, but the difference was significant only in the general health domain and only at 2 months after the operation.

Guillou et al³³ reported that the HRQoL scores returned to at least baseline values by 3 months with the exception of physical and social functioning scores, which returned to baseline values at 3 months only in the open surgery group and not in the laparoscopic surgery group. Moreover, on the basis of the EORTC QLQ-CR38 questionnaire, the MRC CLASICC investigators suggested that symptoms such as mouth dryness, taste alterations, and body dissatisfaction returned to baseline values by 3 months whereas symptoms such as bloated abdomen and weight loss were better than baseline at 3 months.³¹

Despite the lack of any significant differences at baseline, Janson et al¹⁵ in their RCT accentuated improved EORTC QLQ-C30—measured social function (borderline significance) at 12 weeks for patients who underwent laparoscopic colectomy compared with patients after open resection. Yang et al³⁶ showed better cognitive, role, and social functioning and improved global HRQoL at 3 months after laparoscopic surgery compared with open total mesorectal excision for low rectal cancer. Patients complained less frequently about pain, nausea, and micturition even after the first 3 months compared with baseline. Consistent with these data, according to the Greek OP study, which was based on 4 validated questionnaires, patients presented with a significantly better emotional status and improved PF 3 months after laparoscopic colectomy for cancer.⁴⁰ EORTC QLQ-C30— and QLQ-CR38—measured HRQoL, as assessed by Li et al,³⁸ returned to baseline levels 3 months after surgery, and laparoscopic colectomy patients presented with a better body image and fewer financial problems compared with open colectomy patients. These results suggest that patients' HRQoL is similar to or improved compared with that at baseline 3 months after laparoscopic colectomy for cancer.

Breukink et al¹⁸—evaluating HRQoL and sexual function with the SF-36, EORTC QLQ-C30, and EORTC QLQ-CR38 at 3, 6, and 12 months after laparoscopic total mesorectal excision—reported decreased physical and sexual function but increased mental and emotional function at 3 months after surgery. The results derived from the North

American RCT supported symptomatology improvement, such as decreased nausea, cough, and pain frequency even after the second postoperative month.¹⁷ In terms of the factors affecting HRQoL at this time point, the investigators found that baseline values were the strongest predictors of all HRQoL outcomes through the second postoperative month. A baseline QoL score <50 was associated with significantly worse symptoms such as nausea, insomnia, fatigue, activity, and overall health at 2 weeks and 2 months. Surgical complications were also predictors of worse HRQoL in the early postoperative period. Those variables, though, did not exert any effect on HRQoL at later assessment time points (as discussed in the “HRQoL at >1 year” section). The authors suggested a significant association between high disease stage and poorer findings for a variety of symptoms including health, outlook, and general HRQoL at 2 months, whereas these associations did not remain at 18 months.¹⁷

According to Breukink et al,¹⁸ older patients are expected to face more problems with chemotherapy and micturition at 3 months after laparoscopic rectal cancer surgery compared with younger patients. Scarpa et al³⁰ considered bowel function and the incontinence score to be the main predictors of HRQoL at the same time point.

HRQoL at 6 months. With the use of EORTC QLQ-C30 and QLQ-CR38, Jayne et al³¹ reported that 6-month scores remained the same as scores at baseline for global HRQoL, role functioning, cognitive functioning, pain, insomnia, and nausea/vomiting. Although financial difficulties remained at baseline levels in patients who underwent open surgery from 6 months onward, such types of problems did not return to baseline values until 18 months for patients after laparoscopic colectomy. Both the open and laparoscopic groups of patients reported worse physical functioning at 6 months compared with baseline. This deterioration lasted for different periods for the open and laparoscopic arms (as discussed in the “HRQoL at >1 year” section). Fewer problems than at baseline were reported by both groups for emotional functioning, whereas social functioning was worse than baseline for laparoscopic patients up to 3 years postoperatively. There was more fatigue for both groups at 6 months. Laparoscopic patients were relieved of their preoperative constipation problems at 6 months, whereas constipation scores remained the same as those at baseline for patients in the open group. Sexual function had been improved and micturition problems had been alleviated until 6 months after surgery for laparoscopic patients. More problems with adverse effects of chemotherapy were reported up to

6 months postoperatively for both groups, but the scores returned to baseline levels by 18 months for both groups.

On the other hand, Yang et al³⁶ in an NRPC study reported that low rectal cancer patients had increased sexual enjoyment, better physical and social functioning, and an improved body image at 6 months compared with baseline. They recorded a decline in pain, nausea, and micturition problems at the same time point. It has to be mentioned, however, that although a longitudinal observation of HRQoL changes was well reported by Yang et al in a selected group of patients who had undergone total mesorectal excision, no control open group was used for comparison. King et al³² in their RCT mentioned that 60% of laparoscopic patients had recovered at 6 months after surgery whereas almost 80% could drive and cook at the same time. Consistent with the previously mentioned data, Theodoropoulos et al⁴⁰ showed that almost all functional domains were improved 6 months after surgery compared with baseline and 3 months after surgery.

According to Jayne et al,³¹ male patients are expected to face more sexual problems than female patients and patients receiving chemotherapy are expected to have more overall HRQoL problems than the rest of the patients at 6 months after surgery. Higher disease stage, chemotherapy administration, and male sex may be related to worse emotional functioning at this time point.⁴⁰

HRQoL at >1 year. Breukink et al¹⁸ reported that emotional role function and global HRQoL were improved whereas weight loss and pain were decreased 1 year after laparoscopic rectal cancer surgery compared with baseline values. In addition, Staudacher et al,³⁴ comparing HRQoL after laparoscopic and open colectomy, observed that by 12 months after surgery, all the scores in both groups had returned to baseline values. King et al,³² focusing on functional recovery, predicted that patients after laparoscopic colectomy recovered more quickly than those who underwent open colectomy. In particular, 90% of the former group considered themselves fully recovered by 12 months. In agreement with these observations, a case-series study of laparoscopic total mesorectal excision for low rectal cancers concluded that the HRQoL of both groups may be expected to improve over time, particularly over the first postoperative year.³⁶

As mentioned earlier, Jayne et al³¹—evaluating the long-term results of laparoscopic-assisted resection of colorectal carcinoma in an RCT—mentioned that financial problems and deterioration of physical functioning returned to baseline values only 18 months and 3 years after

laparoscopic colectomy for cancer, respectively. In the same study, in terms of laparoscopic patients, Jayne et al found that social functioning returned to baseline levels at 18 months after surgery whereas fatigue remained worse than baseline until 3 years after surgery. On the basis of the EORTC QLQ-CR38 questionnaire, it became clear that the gastrointestinal tract problems increased postoperatively but were less than at baseline for both open and laparoscopic patients by 18 months.³¹ In line with these data, Theodoropoulos et al⁴⁰ suggested that PF, emotional status, and global health were improved significantly 1 year after surgery whereas anxiety and pain were significantly reduced.

According to Sokolovic et al,³⁷ after a mean follow-up period of 2.75 years, 169 patients (121 after laparoscopic resections, of which 35% were performed for malignancy) completed the SF-36 instrument. Statistically significant differences were noted between the median scores in the domain of physical functioning and vitality, and the authors concluded that the laparoscopic patients achieved a better patient-perceived health status in those areas over the long-term than the patients who underwent open surgery. Stucky et al¹⁷ observed significantly improved global HRQoL at 18 months after surgery. Li et al³⁸ found that patients who underwent laparoscopic colectomy had a better body image than those who underwent open colectomy and had scores at 1 year that were similar to baseline values.

Regarding the factors affecting patients' HRQoL, Breukink et al¹⁸ showed that women reported worse body image scores than men 12 months after surgery. In an unselected group of colorectal cancer patients, female and older patients may face more problems concerning their emotional functioning and general health at this time point.³⁷ Yang et al³⁶ suggested that culture barriers and education level are 2 factors that might influence the accuracy of results. As mentioned earlier, Stucky et al¹⁷ reported the significant effect of baseline HRQoL, surgical complications, and disease stage on patients' HRQoL at 3 months after surgery. At 18 months, however, deficient baseline HRQoL and surgical complications did not predict low overall HRQoL anymore. Theodoropoulos et al⁴⁰ showed that male sex, late cancer stage, and chemotherapy were the main factors negatively affecting HRQoL until 6 months after surgery.

Finally, as already noted, according to Jayne et al,³¹ patients who underwent open and laparoscopic colectomy reported worse physical functioning scores at 6 months compared with baseline. This deterioration existed until 3

years for patients after laparoscopic surgery, whereas patients who underwent open colectomy reported better physical functioning from 18 months after surgery. Jayne et al pointed out the effect of chemotherapy on HRQoL, which gradually declined until 18 months after surgery for both group of patients.

Assessment of HRQoL After HALC and SILC

In the prospective RCT by Kang et al,⁴² VAS for pain after HALC was reportedly lower on the first, third, and fourth POD compared with pain scores after open colectomy. Only a little over one-third of the included patients in each arm, though, were operated on for cancer. In an antecedent study of similar design, including only cancer patients, the maximum VAS pain scores in the first postoperative week were significantly lower in the HALC arm (mean, 2.5) versus the open colectomy arm (mean, 6).⁴³ Similar conclusions with regard to improved VAS pain scores after HALC were obtained in a more recent study in which only right colon cancers were managed by either approach.⁴⁴ Nevertheless, in the RCT by Ng et al,⁴⁵ in which HALC was directly compared with totally laparoscopic colectomy for cancer, no significant differences in the first week's VAS pain scores were observed.

In an observational study of safety and feasibility of SILC for right colon resections, the median pain score was 2 (of 10) on the day of the operation and was the same on the first POD, whereas it was nil after the second POD.⁴⁶ In a case-matched comparison of SILC with standard laparoscopic and HALC approaches by Papaconstantinou et al,⁴⁷ in which half of the surgeries were performed for cancer, the maximum pain score on PODs 1 and 2 was significantly lower in the SILC group. In a recently published multicenter trial of SILC versus multiport laparoscopic colectomy, including cancer patients at a proportion of almost 40%, the maximum POD 1 pain scores were significantly lower for SILC (4.9 vs 5.6, $P = .005$).⁴⁸ In a case-matched study by Lee et al,⁴⁹ in which SILC in 46 patients (25 operated on for neoplastic colorectal disease) was compared with multiport laparoscopic colectomy, the cosmetic score was significantly higher for the SILC group than that for the multiport group whereas no significant difference in body image scores was detected between the 2 groups.

DISCUSSION

A clinically important long-term beneficial effect on patient HRQoL after laparoscopic colectomy for cancer has not been clearly shown compared with conventional

open resections. Most studies included in this review have not shown a statistically significant difference in HRQoL between laparoscopic and open colectomy.^{16,30} Nevertheless, it is important to mention that any differences in HRQoL favored laparoscopic colectomy, especially during the first postoperative year.¹⁷ Except for the prospective evaluation of Breukink et al¹⁸ after laparoscopic mesorectal excision, the recently published individual item analysis of HRQoL assessment in the COST trial,¹⁷ and the Greek study focusing specifically on laparoscopic colectomy cancer patients,⁴⁰ longitudinal assessments of HRQoL have not been widely available. Therefore a further evaluation and a better understanding of HRQoL changes over time are needed for the best preoperative consultation for colorectal cancer patients. On the basis of the included studies, there is a deterioration in physical function and an aggravation of patients' symptoms during the first postoperative month after laparoscopic colectomy. A variety of trials suggest that this deterioration lasts 2 to 3 weeks and, after that period, patients' complaints ameliorate and progressively improve until the third postoperative month, when the HRQoL scores reach the baseline values.^{33,50} Interestingly, although most trials report worse physical function scores in the first month, emotional and social function is believed to be improved 1 month after surgery compared with baseline.³⁷ This emotional improvement is accompanied by less anxiety and remains steady throughout the first year. The baseline HRQoL scores are believed to be influenced by the serious anxiety and adverse psychological distress due to a recent diagnosis of cancer. Conversely, the positive effect on patients' mood may be attributed to the psychological self-esteem enhancement after overcoming such a major health condition. The changes in the patients' life perspectives that follow the diagnosis of cancer may be another translation of these results.

Most trials included in this analysis predict a progressive improvement in HRQoL during the first 3 months.^{17,51} The main symptoms reported after laparoscopic colectomy, such as pain, fatigue, loss of appetite, and micturition, were found to be alleviated and physical, social, and role function was found to reach the preoperative values by 3 months after surgery. On the other hand, Jayne et al³¹ reported a persistence of "physical" problems and social dysfunction up to 3 years after laparoscopic colectomies. This observation probably has its explanation in the divergence of studies' populations and different patients' support.

Almost all the patients are expected to have fully recovered by 12 months after surgery. Symptoms such as fa-

tigue and pain are significantly alleviated, and the physical, emotional, social, and role function is impressively improved at this time compared with other time intervals and baseline values. Moreover, recent studies conclude that patients' HRQoL scores 1 year after surgery are comparable with those of the general population.⁵² Staudacher et al,³⁴ in a case-series trial evaluating HRQoL after laparoscopic and open total mesorectal excision, suggested that patients after the laparoscopic procedure presented with better social functioning scores during the first postoperative month compared with those who underwent open surgery. This better social functioning recently has been reported to be a predictor of improved HRQoL, especially for patients with rectal cancer.⁵³

On the basis of the recent studies, it is obvious that older patients are expected to confront more difficulties related to micturition, chemotherapy, and general health during the first postoperative year and particularly during the first 3 months. In addition, women may be more influenced in terms of emotional function and body image, whereas men will probably have more sexual problems develop during the first postoperative year.^{18,31,36} Chemotherapy-treated patients report worse physical functioning and general health scores during the first 6 months, but these effects decline gradually throughout the first year.³¹ On the other hand, recent trials including laparoscopic and open colectomy outcomes suggest that the baseline HRQoL scores, the surgical complications, and the personalities of patients are the main predictors of HRQoL outcomes during the first 18 postoperative months.^{17,51}

An important issue that has been rather underreported in the studies including HRQoL as endpoints is the effect of conversions from laparoscopic to open surgery on HRQoL.^{16,33} The poorer results in terms of HRQoL for the "converted" compared with the rest of the laparoscopic patients, which were shown in the analysis of short-term data of the COST study,¹⁶ as well as the significantly higher early morbidity rates that these patients had in the MRC CLASICC trial,³³ may invariably affect at least the short-term HRQoL advantages. The fact that all patients randomized to laparoscopic colectomy were aggregated in an intention-to-treat analysis in those large-scale randomized studies may not have permitted a beneficial effect of the minimally invasive approach to be shown.^{16,33} So, patients at low risk for intraoperative conversion may acquire a higher chance to be favored by the laparoscopic benefits.¹⁶

The superior results regarding early postoperative pain scores after HALC compared with the open approach

are expected because of the limited HALC incision length.^{42–44} HALC, though, has not proven to be advantageous in this aspect when compared with a multiport laparoscopic approach.⁴⁵ SILC seems to be more promising, at least in the context of minimization of pain and improved cosmesis.^{47–49} On the other hand, in contrast to the standard laparoscopic and laparoscopic-assisted approaches, HRQoL after HALC and SILC has not been adequately evaluated with standardized and validated questionnaires.

The clinical heterogeneity among the selected studies represents the main obstacle to establishing robust conclusions. Every study used different instruments and assessment time points for HRQoL measurement, and the data cannot be easily compared. However, guided by these conclusions, colorectal surgeons may enrich their experience in terms of preoperative consultation for colorectal cancer patients who prefer to undergo laparoscopic colectomy. In particular, a colorectal cancer patient can be informed that after laparoscopic colectomy, (1) there may be physical deterioration and aggravation of symptoms initially, which are expected to be temporary and followed by improvement in all HRQoL domains; (2) they may be emotionally better even from the first month after surgery, and the treatment of their cancer will have a positive effect on their mood; (3) their overall HRQoL may be even better than that at baseline at the end of the first year; and (4) the effect of chemotherapy on their HRQoL is expected not to last >6 months (ie, approximately the period required for chemotherapy administration). The addition of more patients and the extension of the follow-up period will improve our knowledge of how HRQoL changes over time after laparoscopic colectomy for colorectal cancer and will allow colorectal surgeons to give their patients valuable information regarding their lives after surgery.

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