

Quality of life after laparoscopic vs open sphincter-preserving resection for rectal cancer

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Received: February 25, 2013 Revised: May 2, 2013

Accepted: May 16, 2013

Published online: August 7, 2013

Abstract

AIM: To compare quality of life (QoL) outcomes in Chinese patients after curative laparoscopic vs open surgery for rectal cancer.

METHODS: Eligible Chinese patients with rectal cancer undergoing curative laparoscopic or open sphincter-preserving resection between July 2006 and July 2008 were enrolled in this prospective study. The QoL outcomes were assessed longitudinally using the validated Chinese versions of the European Organization for Research and Treatment of Cancer QLQ-C30 and QLQ-CR38 questionnaires before surgery and at 4, 8, and 12 mo after surgery. The QoL scores at the different time points were compared between the laparoscopic and open groups. A higher score on a functional scale indicated better functioning, whereas a higher score on a symptom scale indicated a higher degree of symptoms.

RESULTS: Seventy-four patients (49 laparoscopic and 25 open) were enrolled. The two groups of patients were comparable in terms of sociodemographic data, types of surgery, tumor staging, and baseline mean QoL scores. There was no significant decrease from baseline in global QoL for the laparoscopic group at different time points, whereas the global QoL was worse compared to baseline beginning at 4 mo but returned to baseline by 12 mo for the open group ($P = 0.019$, Friedman test). Compared to the open group, the laparoscopic group had significantly better physical (89.9 ± 1.4 vs 79.2 ± 3.7 , $P = 0.016$), role (85.0 ± 3.4 vs 63.3 ± 6.9 , $P = 0.005$), and cognitive (73.5 ± 3.4 vs 50.7 ± 6.2 , $P = 0.002$) functioning at 8 mo, fewer micturition problems at 4-8 mo (4 mo: 32.3 ± 4.7 vs 54.7 ± 7.1 , $P = 0.011$; 8 mo: 22.8 ± 4.0 vs 40.7 ± 6.9 , $P = 0.020$), and fewer male sexual problems from 8 mo onward (20.0 ± 8.5 vs 76.7 ± 14.5 , $P = 0.013$). At 12 mo after surgery, no significant differences were observed in any functional or symptom scale between the two groups, with the exception of male sexual problems, which remained worse in the open group (29.2 ± 11.3 vs 80.0 ± 9.7 , $P = 0.026$).

CONCLUSION: Laparoscopic sphincter-preserving resection for rectal cancer is associated with better preservation of QoL and fewer male sexual problems when compared with open surgery in Chinese patients. These findings, however, should be interpreted with caution because of the small sample size of the study.

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Key words: Quality of life; Rectal cancer; Laparoscopic surgery; Sphincter-preserving surgery; European Organization for Research and Treatment of Cancer QLQ-C30; European Organization for Research and Treatment of Cancer QLQ-CR38

Core tip: This prospective nonrandomized study dem-

onstrates that laparoscopic sphincter-preserving resection for rectal cancer is associated with better preservation of quality of life (QoL) and fewer male sexual problems when compared with open surgery in Chinese patients in the first postoperative year. Our study has several strengths. First, our study only focused on Chinese patients undergoing curative sphincter-preserving rectal resection, thus minimizing the impact of other potential confounders on the QoL assessment. Second, all our questionnaires were administered by a single research assistant and were completed by the patients during clinic visits. Therefore, we achieved 100% compliance at different time points.

Ng SSM, Leung WW, Wong CYN, Hon SSF, Mak TWC, Ngo DKY, Lee JFY. Quality of life after laparoscopic vs open sphincter-preserving resection for rectal cancer. *World J Gastroenterol* 2013; 19(29): 4764-4773 Available from: URL: <http://www.wjg-net.com/1007-9327/full/v19/i29/4764.htm> DOI: <http://dx.doi.org/10.3748/wjg.v19.i29.4764>

INTRODUCTION

Accumulating evidence from recent randomized trials indicates that laparoscopic surgery for rectal cancer is associated with clear short-term benefits and similar tumor clearance when compared with open surgery^[1-5]. Researchers currently are particularly eager to know whether the long-term oncologic results are also comparable between the two approaches for rectal cancer^[6]. Indeed, long-term survival has always been regarded as the most important study endpoint in these clinical trials^[7]. However, functional outcomes and quality of life (QoL) must not be ignored in the quest for surgical and oncologic excellence.

Notably, up to 30% of rectal cancer survivors will develop urinary and sexual dysfunctions after surgery attributable to inadvertent injury of the pelvic autonomic nerves^[8]. Bowel dysfunction and fecal incontinence are also not uncommon after sphincter-preserving rectal surgery and radiotherapy^[9,10]. These functional hazards will have a significant negative impact on the patients' functioning and QoL for the remainder of his/her life^[11].

Therefore, in addition to traditional study endpoints such as postoperative recovery, morbidity, and survival, functional results and QoL have recently become important outcome parameters for defining surgical performance in clinical trials^[12]. Within the context of medical and healthcare research, QoL is the patient's subjective perception of the impact of his/her disease and its treatments on his/her physical, psychological, and social functioning and general well-being^[13]. Health-related QoL after cancer surgery can be assessed by standardized instruments such as the questionnaires developed by the European Organization for Research and Treatment of Cancer (EORTC), which contain multidimensional generic and disease-specific domains; the EORTC

QLQ-C30 and QLQ-CR38 are the most commonly used questionnaires in colorectal cancer trials^[14,15].

The magnified vision and less traumatic surgery offered by the laparoscopic approach may allow better preservation of the pelvic autonomic nerves^[4,5], and presumably, functional outcomes following laparoscopic surgery for rectal cancer may be better compared to open surgery. However, conflicting results have been reported in the literature^[2,16]; some studies have even reported a higher incidence of sexual dysfunction after laparoscopic rectal surgery^[17,18]. Furthermore, it is also unclear whether the short-term and long-term clinical benefits associated with the laparoscopic approach will translate into better QoL outcomes for patients with rectal cancer. To date, few studies have specifically compared QoL outcomes between laparoscopic and open surgery for rectal cancer^[19]. We therefore conducted this prospective study to compare QoL outcomes in Chinese patients after curative laparoscopic vs open sphincter-preserving surgery for rectal cancer. Changes in QoL over time were also longitudinally assessed and compared between the two groups.

MATERIALS AND METHODS

Between July 2006 and July 2008, eligible Chinese patients with rectal cancer undergoing curative laparoscopic or open sphincter-preserving resection at our hospital were enrolled in this prospective study. The study was approved ethically by the Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee (CRE-2005.259). All patients provided written informed consent. We excluded the following patients: patients who presented with recurrent disease, patients who required multivisceral en bloc resections, patients who required conversion from laparoscopic to open surgery, patients with intestinal obstruction or perforation, and patients with known dementia or cognitive dysfunction.

The operative approach (laparoscopic or open resection) was decided by the operating surgeon after considering the tumor characteristics and the patient's preference. All operations were performed by surgeons experienced in both laparoscopic and open colorectal surgery. Our laparoscopic techniques for resection of rectal cancer were previously described^[20,21]. For mid and low rectal cancer located 5-12 cm from the anal verge, sphincter-preserving total mesorectal excision with protective loop ileostomy was performed. All patients in this study underwent ileostomy closure within 7 mo after the primary surgery. Adjuvant therapy was administered to patients with pathologic stage II or III disease. Clinical parameters including patient sociodemographic data, types of surgery, tumor staging, and short-term clinical outcomes were prospectively recorded.

After surgery, all patients were followed-up regularly at 4-mo intervals for clinical examination and carcinoembryonic antigen testing. All patients were free of recurrence during the study period.

Quality of life assessment

Patient QoL was assessed using the QLQ-C30 and QLQ-CR38 questionnaires developed by the EORTC^[14,15]. The clinical validity and reliability of the Chinese versions of both QLQ-C30 and QLQ-CR38 have been confirmed^[22-24]. QLQ-C30 is a generic questionnaire for the assessment of QoL in cancer patients^[14]. It includes 30 items, 24 of which are combined to form a global QoL scale, five functional scales (physical, role, emotional, cognitive, and social), and three symptom scales (fatigue, nausea/vomiting, and pain). The other six single items evaluate dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties. QLQ-CR38 is a specific questionnaire module specifically designed for assessment of QoL in patients with colorectal cancer^[15]. It consists of 38 items covering symptoms and side effects related to different colorectal cancer treatment modalities. The module contains four functional scales (body image, sexual functioning, sexual enjoyment, and future perspective) and eight symptom scales/items (micturition problems, chemotherapy side effects, gastrointestinal tract symptoms, male sexual problems, female sexual problems, defecation problems, stoma-related problems, and weight loss).

The questionnaires were scored according to the EORTC Scoring Manual^[25]. Each item has four response alternatives (scoring 1-4), “not at all”, “a little”, “quite a bit”, and “very much”, except for the global QoL scale, which has seven alternatives (scoring 1-7) from “very poor” to “excellent”. All questionnaire responses and scores were linearly transformed to a 0-100 scale. A higher score on the global QoL and functional scales represented a higher level of QoL and functioning, whereas a higher score on the symptom scales/items represented a higher degree of symptoms or dysfunction.

All questionnaires were administered by a single research assistant and completed by the patients before surgery and at 4, 8 and 12 mo after surgery (during clinic visits). Every effort was made to avoid missing data during questionnaire administration.

Statistical analysis

QoL scores were presented as the mean \pm SD. For longitudinal assessment of changes of QoL scores over time, the Friedman test was used to identify overall significant differences between QoL scores at the four different time points (before surgery and at 4, 8 and 12 mo after surgery) for each variable. When the overall *P* value indicated statistical significance (*i.e.*, $P < 0.05$), a *post-hoc* Wilcoxon signed-rank test for paired data using a simplified Bonferroni correction was used to compare pairs of QoL scores (with $P < 0.0083$ considered significant for six pair-wise comparisons). Cross-sectionally, to test for differences in QoL scores between the laparoscopic and open groups at different time points, the Mann-Whitney *U* test was used. The baseline characteristics of the two groups of patients were compared using the χ^2 test (or Fisher's exact test when appropriate), Student's *t* test, and

the Mann-Whitney *U* test for categorical, parametric, and non-parametric data, respectively. A *P* value of less than 0.05 was considered statistically significant, whereas a difference in mean QoL scores of more than 10 points was regarded as clinically significant^[26]. Using a 5% significance level, a total sample size of 75 (50 laparoscopic and 25 open) would have a power of 80% to detect a minimum difference of 10 points in mean QoL scores between the two groups.

RESULTS

Between July 2006 and July 2008, 74 patients were enrolled in this study: 49 patients underwent laparoscopic surgery, and 25 patients underwent open surgery. The two groups of patients were comparable in terms of sociodemographic data, types of surgery, tumor staging, and the proportion of patients who received adjuvant therapy (Table 1). The overall short-term morbidity rates of the laparoscopic and open groups were 34.7% and 52%, respectively ($P = 0.152$, χ^2 test). Transient urinary retention and septic complications (including chest infection, wound infection, and urinary tract infection) occurred more frequently in the open group. No patient in this study required reoperation for postoperative complications. With the exception of higher baseline symptom scores for insomnia in the open group, there was no significant difference in baseline mean QoL scores for any of the functional or symptom scales between the two groups (Table 2).

EORTC QLQ-C30

There was no significant decrease from baseline in global QoL scores for the laparoscopic group at the evaluated time points; the statistically significant difference detected with the Friedman test ($P = 0.044$) was due to an increase in global QoL scores from 4 to 8 mo ($P = 0.031$, post-hoc Wilcoxon signed-rank test) (Figure 1A). For the open group, the global QoL was worse than at baseline from 4 mo onward but gradually returned to baseline by 12 mo ($P = 0.019$, Friedman test; a significant decrease occurred between baseline and 4 mo, $P = 0.004$, post-hoc Wilcoxon sign-ranked test) (Figure 1A). Both the laparoscopic and open groups showed a significant decrease in physical functioning from 4 to 12 mo postoperatively ($P < 0.001$, Friedman test) (Figure 1B). Role functioning and social functioning were significantly worse than at baseline from 4 to 12 mo for the open group but remained the same as at baseline for the laparoscopic group (Figure 1C and D). There was no change from baseline in emotional functioning for either group. Cognitive functioning fluctuated over time for the laparoscopic group ($P = 0.035$, Friedman test) but remained the same as at baseline for the open group.

There was no significant change from baseline in fatigue scores for the laparoscopic group; more fatigue was reported in the open group beginning at 4 mo, but it returned to the baseline level by 12 mo ($P = 0.003$, Fried-

Table 1 Sociodemographic and clinicopathologic data of the patients *n* (%)

	Laparoscopic group	Open group	<i>P</i> value
Number of patients	49	25	/
Age (yr, mean ± SD)	65.6 ± 11.3	66.7 ± 12.4	0.705 ¹
Sex (male/female)	30/19	15/10	0.919 ²
Body mass index (kg/m ² , mean ± SD)	22.4 ± 3.4	21.4 ± 3.5	0.210 ¹
Number of patients with comorbidities	27 (55.1)	13 (52)	0.800 ²
Marital status (married/divorced/widow/single)	36/5/6/2	18/3/4/0	0.742 ²
Education level (under primary/primary/secondary/tertiary or above)	10/19/16/4	8/10/6/1	0.623 ²
Tumor location in rectum (upper/middle/lower)	26/15/8	12/10/3	0.697 ²
Types of surgery (AR/LAR with TME)	24/25	12/13	0.936 ²
Number of patients with temporary ileostomy	25 (51)	13 (52)	0.936 ²
Number of patients with complications	17 (34.7)	13 (52)	0.152 ²
Subclinical anastomotic leak	0	1	
Anastomotic bleeding	1	0	
Chest infection	1	3	
Wound infection	2	5	
Urinary tract infection	2	5	
Urinary retention	4	5	
Prolonged ileus	7	3	
Others	1	3	
Reoperation	0	0	
AJCC staging (I / II / III)	3/26/20	2/13/10	0.955 ²
Adjuvant chemotherapy	20 (40.8)	10 (40)	0.946 ²
Adjuvant radiotherapy	11 (22.4)	7 (28)	0.599 ²

¹Student's *t* test; ² χ^2 test. AR: Anterior resection; LAR: Low anterior resection; TME: Total mesorectal excision; AJCC: American Joint Committee on Cancer.

man test; a significant increase occurred between baseline and 4 mo, $P = 0.004$, *post-hoc* Wilcoxon sign-ranked test) (Figure 2A). The 4-mo to 12-mo symptom scores remained similar to those at baseline for nausea/vomiting, pain, dyspnea, insomnia, appetite loss, constipation, and diarrhea for both groups. More financial difficulties were reported at 4 mo postoperatively, but this returned to baseline levels by 12 mo for both groups.

Compared to the open group, the laparoscopic group had significantly better global QoL at 4 and 8 mo, better physical, role, and cognitive functioning at 8 mo, less fatigue at 4 and 8 mo, and less nausea/vomiting, appetite loss, and financial difficulties at 8 mo (Table 2). However, at 12 mo after surgery, no significant differences were observed in any of the EORTC QLQ-C30 functional or symptom scales between the two groups.

EORTC QLQ-CR38

There was no significant change from baseline in body image for the open group; for the laparoscopic group, body image was significantly worse compared to baseline beginning at 4 mo but returned to baseline levels by 12 mo ($P = 0.002$, Friedman test). Sexual functioning remained the same as at baseline for both groups (Figure 1E), but the overall scores for sexual functioning were low (Table 2), indicating that the majority of patients were sexually inactive. There was a trend toward worsening of future perspective scores over time for the laparoscopic ($P = 0.074$, Friedman test) and open ($P = 0.094$, Friedman test) groups, but the change was statistically insignificant.

Improvement in micturition problems was noted

in the laparoscopic group ($P = 0.031$, Friedman test; a decrease in symptom scores primarily occurred between baseline and 8 mo, $P = 0.019$, *post-hoc* Wilcoxon sign-ranked test), but there was no significant change from baseline for the open group (Figure 2B). More problems with chemotherapy side effects were reported at 4 mo postoperatively, but returned to baseline levels by 12 mo for patients receiving chemotherapy in both groups (Figure 2C). There was no significant change from baseline in gastrointestinal tract symptoms for either group (Figure 2D). Defecation problems significantly decreased from 4 to 8 mo for patients without stoma in the laparoscopic group ($P = 0.003$, Friedman test; $P = 0.003$, *post-hoc* Wilcoxon sign-ranked test), but they remained the same as at baseline for the open group. A significant improvement in weight loss over time was observed in both groups (Figure 2E). Compared to the open group, the laparoscopic group had significantly fewer micturition problems at 4 and 8 mo and fewer gastrointestinal symptoms at 8 mo (Table 2).

Sexual enjoyment and sexual problems were not evaluated in the female patients in this study because they were all sexually inactive. Altogether, 19 male patients (14 in the laparoscopic group and 5 in the open group) who had been sexually active before surgery were assessed for changes in QoL related to sexual activities (Table 3). Sexual enjoyment and male sexual problems remained relatively stable at different time points for the laparoscopic group, but less sexual enjoyment and more sexual problems were reported from 4 to 12 mo for the open group (Figures 1F and 2F). Compared to the laparoscopic group, the open group had significantly more sexual

Table 2 Comparison of European Organization for Research and Treatment of Cancer QLQ-C30 and QLQ-CR38 scores between the laparoscopic and open groups at different time points

	Baseline			4 mo			8 mo			12 mo		
	Lap	Open	P value	Lap	Open	P value	Lap	Open	P value	Lap	Open	P value
EORTC QLQ-C30												
Functional scales												
Global QoL	72.4 (3.4)	68.3 (5.2)	0.443	65.8 (3.6)	47.3 (5.9)	0.009	73.6 (3.8)	52.0 (5.9)	0.003	71.1 (3.4)	61.0 (7.0)	0.371
Physical	94.7 (1.3)	91.5 (2.6)	0.255	86.4 (2.3)	77.6 (4.1)	0.056	89.9 (1.4)	79.2 (3.7)	0.016	87.1 (2.6)	81.3 (4.0)	0.149
Role	88.8 (3.0)	92.7 (3.1)	0.660	75.9 (4.5)	67.3 (6.6)	0.155	85.0 (3.4)	63.3 (6.9)	0.005	82.7 (3.9)	71.3 (7.1)	0.129
Emotional	71.1 (4.1)	66.0 (5.4)	0.404	76.0 (4.0)	82.0 (4.9)	0.401	79.8 (3.4)	71.3 (6.3)	0.379	79.1 (3.2)	71.0 (6.3)	0.579
Cognitive	71.1 (4.2)	66.7 (5.5)	0.415	67.7 (3.6)	59.3 (5.8)	0.284	73.5 (3.4)	50.7 (6.2)	0.002	61.9 (4.2)	60.0 (6.7)	0.940
Social	82.7 (3.2)	88.0 (4.4)	0.292	73.5 (3.1)	64.7 (5.7)	0.268	76.9 (3.8)	62.7 (7.1)	0.110	76.5 (4.0)	62.7 (7.4)	0.124
Symptom scales/items												
Fatigue	16.6 (2.8)	14.2 (2.9)	0.859	17.7 (2.6)	27.6 (4.3)	0.042	13.8 (2.7)	28.9 (5.9)	0.027	12.0 (2.2)	15.6 (4.0)	0.520
Nausea/vomiting	0 (0)	0.7 (0.7)	0.162	3.1 (1.3)	6.7 (3.7)	0.931	0 (0)	2.7 (2.1)	0.046	0 (0)	1.3 (1.3)	0.162
Pain	14.3 (3.2)	16.7 (4.5)	0.772	20.1 (2.7)	25.3 (5.2)	0.534	16.7 (2.7)	27.3 (5.2)	0.089	15.6 (2.9)	19.3 (5.4)	0.755
Dyspnea	4.1 (1.6)	2.7 (1.8)	0.581	7.5 (2.2)	16 (5.5)	0.208	2.7 (1.3)	12 (6.0)	0.252	4.1 (2.1)	12.0 (5.0)	0.065
Insomnia	33.3 (5.1)	58.7 (8.5)	0.011	32.0 (5.1)	46.7 (8.2)	0.141	27.2 (4.8)	45.3 (7.9)	0.052	30.6 (5.1)	46.7 (8.4)	0.129
Appetite loss	8.8 (2.7)	6.7 (4.3)	0.313	7.5 (2.2)	14.7 (6.4)	0.794	6.8 (2.2)	17.3 (4.8)	0.035	7.5 (3.0)	10.7 (4.2)	0.330
Constipation	18.4 (4.6)	29.3 (8.0)	0.292	11.6 (4.2)	12.0 (4.7)	0.525	15.0 (4.4)	6.7 (2.7)	0.508	18.4 (4.5)	10.7 (5.3)	0.205
Diarrhea	19.7 (4.4)	17.3 (6.1)	0.759	23.1 (4.9)	30.7 (7.2)	0.394	15.0 (4.2)	29.3 (8.2)	0.156	15.0 (4.1)	21.3 (6.6)	0.379
Financial difficulties	13.6 (4.0)	14.7 (4.7)	0.426	24.5 (4.3)	37.3 (6.5)	0.066	23.1 (5.2)	42.7 (7.1)	0.010	13.6 (3.6)	20.0 (6.7)	0.580
EORTC QLQ-CR38												
Functional scales												
Body image	93.9 (1.9)	93.3 (2.6)	0.945	81.0 (4.2)	82.7 (6.0)	0.699	81.2 (3.9)	85.3 (4.8)	0.834	87.8 (3.7)	84.4 (5.6)	0.526
Sexual functioning	18.7 (3.9)	14.0 (5.3)	0.268	18.7 (4.1)	8.7 (5.1)	0.069	19.0 (4.2)	16.0 (5.7)	0.630	19.0 (4.3)	17.3 (5.7)	0.807
Future perspective	54.4 (4.9)	64.0 (7.2)	0.272	54.4 (4.4)	45.3 (6.0)	0.309	44.2 (5.1)	42.7 (7.8)	0.779	44.2 (4.9)	44.0 (6.9)	0.995
Symptom scales/items												
Micturition problems	37.8 (4.4)	38.7 (6.9)	0.907	32.3 (4.7)	54.7 (7.1)	0.011	22.8 (4.0)	40.7 (6.9)	0.020	31.6 (4.5)	41.3 (6.9)	0.246
Chemotherapy side effects ¹	16.7 (4.1)	10.0 (2.6)	0.530	41.1 (7.3)	44.4 (11.1)	0.846	20.6 (4.7)	28.9 (7.8)	0.422	8.9 (3.3)	17.8 (6.0)	0.214
Gastrointestinal tract symptoms	20.7 (2.2)	19.5 (2.8)	0.817	16.6 (1.9)	18.1 (2.8)	0.656	15.9 (1.9)	24.8 (3.3)	0.022	18.0 (2.2)	16.3 (3.3)	0.546
Defecation problems ²	22.2 (2.3)	15.5 (3.5)	0.133	24.3 (3.6)	21.4 (3.0)	0.821	11.8 (2.5)	23.0 (4.9)	0.062	13.2 (2.9)	16.3 (3.3)	0.235
Weight loss	27.9 (4.7)	38.7 (8.3)	0.376	8.8 (3.2)	24.0 (7.6)	0.079	6.1 (2.1)	17.3 (6.1)	0.094	6.1 (2.1)	10.7 (4.2)	0.383

¹Only for patients who received chemotherapy, 20 in the laparoscopic group and 10 in the open group; ²Only for patients without temporary loop ileostomy, 24 in the laparoscopic group and 12 in the open group. Quality of life (QoL) scores are presented as the mean (standard error of mean). Scores ranged from 0 to 100. A higher score on a functional scale indicates better functioning, whereas a higher score on a symptom scale indicates a higher degree of symptoms. Scores in the laparoscopic and open groups were compared by the Mann-Whitney *U* test. EORTC: European Organization for Research and Treatment of Cancer.

problems at 8 mo ($P = 0.013$, Mann-Whitney *U* test) and 12 mo ($P = 0.026$, Mann-Whitney *U* test) postoperatively.

At 12 mo after surgery, no significant differences were observed in any of the EORTC QLQ-CR38 functional or symptom scales between the two groups, with the exception of male sexual enjoyment and sexual problems, which remained worse in the open group.

DISCUSSION

This prospective study was specifically designed to compare QoL outcomes in Chinese patients after curative laparoscopic *vs* open sphincter-preserving resection for rectal cancer. Our study has several strengths. First, although nonrandomized, the baseline characteristics and sociodemographic data of the two groups of patients were similar, and a fair comparison could therefore be made. The social backgrounds of patients, such as marital status and education level, which may impact QoL after surgery^[27], have seldom been provided by other studies comparing QoL after laparoscopic and open rectal surgery^[1-3,28,29]. Second, other studies have included meta-

static cases and abdominoperineal resection in their QoL analysis^[1,3,28], whereas our study only focused on Chinese patients undergoing curative sphincter-preserving rectal resection, thus minimizing the impact of other potential confounders on the QoL assessment. Third, all our questionnaires were administered by a single research assistant and were completed by the patients during clinic visits. Therefore, we achieved 100% compliance at different time points, a figure that was not achieved by other studies in which the questionnaires were collected by mail^[28,29]. Full compliance with the questionnaires is essential to ensure a precise longitudinal assessment of QoL changes.

Our results showed that laparoscopic sphincter-preserving resection for rectal cancer was associated with better preservation of QoL and fewer male sexual problems when compared with the open approach in the first year after surgery. Other benefits of the laparoscopic approach, such as better physical functioning and fewer micturition and gastrointestinal problems, were evident only in the short term. These findings are in accordance with those reported by Braga *et al*^[3], who found that QoL after laparoscopic surgery for rectal cancer was better

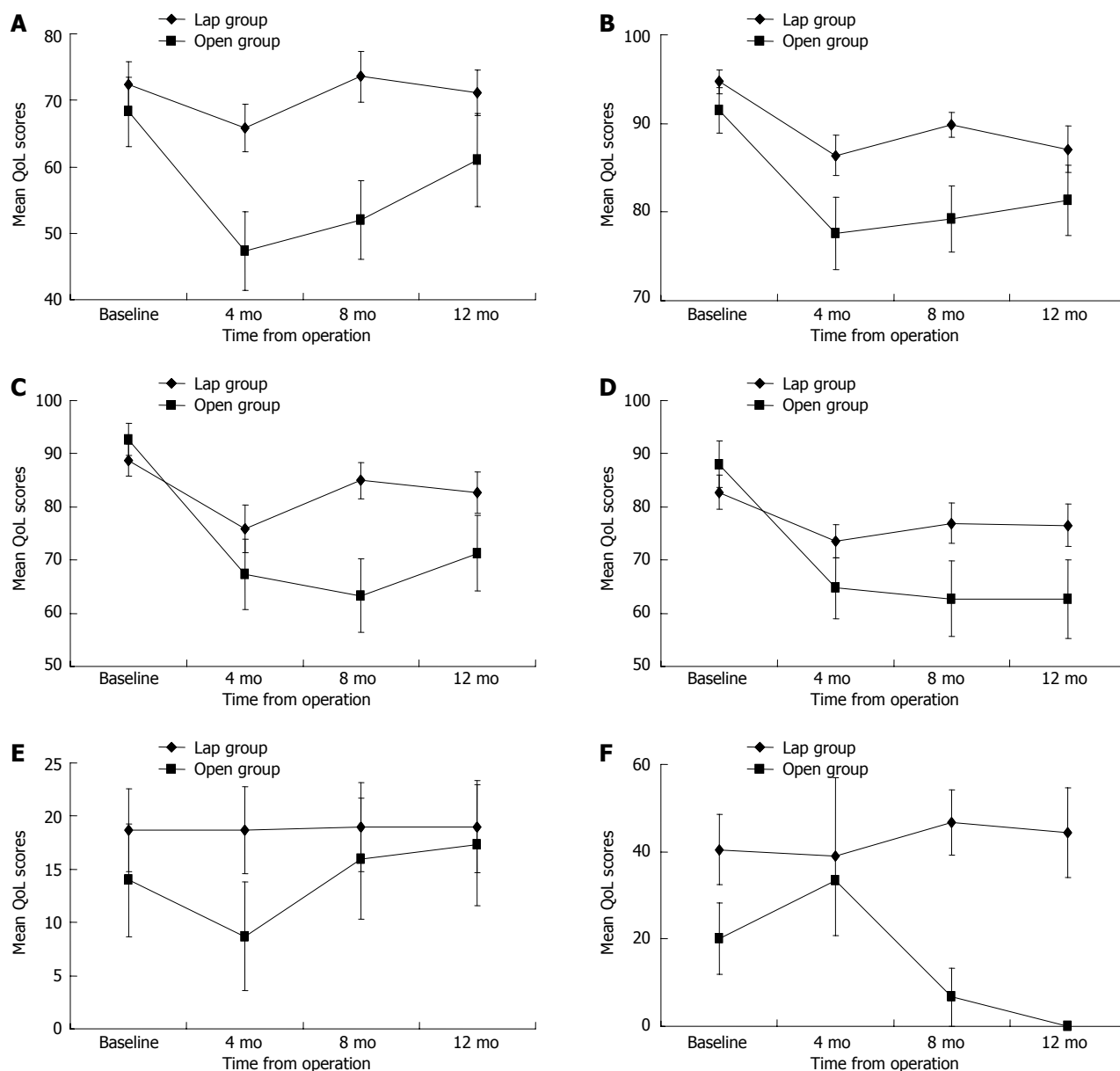


Figure 1 Longitudinal assessment of changes in quality of life scores over time for global quality of life and various functional scales. A: Global health status/quality of life (QoL); B: Physical functioning; C: Role functioning; D: Social functioning; E: Sexual functioning; F: Sexual enjoyment (only for men who have been sexually active). A higher score indicates better functioning. Error bars indicate the standard error of the mean. The Friedman test was not performed for sexual enjoyment, as the number of patients changed at different time points.

than the open approach only in the first year after surgery. Li *et al*^[28] also reported transient QoL benefits in the early postoperative period after laparoscopic rectal surgery when compared with the open approach, but the overall QoL of the two groups was similar at a 1-year follow-up. Better QoL in the laparoscopic arm was also reported by the comparison of open *vs* laparoscopic surgery for mid and low rectal cancer after neoadjuvant chemoradiotherapy (COREAN) trial at 3 mo, but 1-year data were not provided^[2].

On longitudinal assessment, the QoL scores of most of the functional and symptom scales of the laparoscopic group in our study remained relatively stable at different time points, whereas most of the QoL scores in the open group predominantly showed deterioration at 4-8 mo but

gradually recovered by 1 year after surgery. This explains why significant differences in QoL scores between the laparoscopic and open groups in our study were primarily observed at 8 mo after surgery.

We have previously reported better short-term clinical outcomes and less long-term morbidity among patients undergoing laparoscopic surgery for rectal cancer when compared with the open approach^[7,20,21]; this may partly account for the better short-term QoL associated with the laparoscopic arm in our study. However, in addition to the healthcare experience, patients' expectations also play an important role in the determination of QoL. According to the dynamic model proposed by Carr *et al*^[30], QoL is typically impacted when the health experience falls short of expectations. The better preservation of

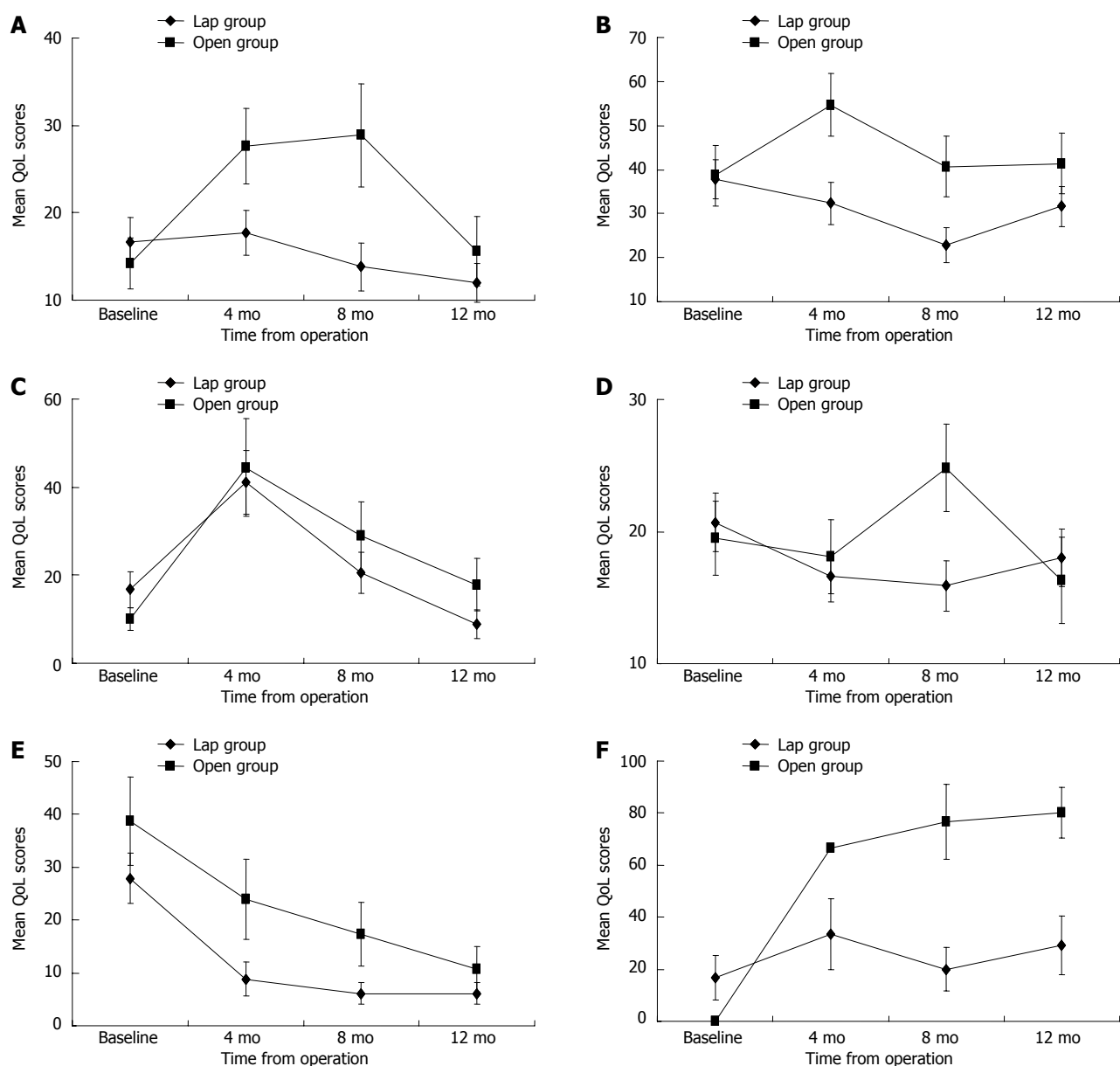


Figure 2 Longitudinal assessment of changes in quality of life scores over time for various symptom scales/items. A: Fatigue; B: Micturition problems; C: Chemotherapy side effects (only for patients who received chemotherapy); D: Gastrointestinal tract symptoms; E: Weight loss; F: Male sexual problems (only for men who have been sexually active). A higher score indicates a higher degree of symptoms. Error bars indicate the standard error of the mean. The Friedman test was not performed for male sexual problems, as the number of patients changed at different time points. QoL: Quality of life.

QoL in the laparoscopic group over time may imply that most of their initial positive expectations of laparoscopic surgery (the treatment that they had chosen) were met by their postoperative experience (the clinical benefits) and that the “expectation-experience homeostasis” remained unchanged throughout the entire assessment period. However, discrepancies between preoperative expectations and the postoperative experience may explain the initial deterioration of QoL in the open group, and a period of adaptation and alteration of expectations may have been needed to reestablish “homeostasis” by 1 year after surgery.

Interestingly, the same argument can also be used to explain the paradoxical finding of a worse functional scale of body image after laparoscopic surgery in our

study. Patients in the laparoscopic group might have had high expectations regarding the initial cosmetic results. However, when they realized that the final cosmetic outcome (a 5-cm incisional wound over the left iliac fossa and an ileostomy over the right iliac fossa) did not meet their preoperative expectations, a significant impact on QoL with respect to body image occurred. Conversely, patients in the open group who did not have high expectations regarding the cosmetic results might not have experienced a significant change in the functional scale of body image after surgery.

Urinary and sexual dysfunctions are recognized complications after rectal cancer surgery, which may have a negative impact on QoL^[11]. In our study, the laparoscopic group had significantly fewer micturition problems at 4-8

Table 3 Sexual enjoyment and sexual problems among men who have been sexually active: Laparoscopic *vs* open groups

	Baseline			4 mo			8 mo			12 mo		
	Lap	Open	<i>P</i> value	Lap	Open	<i>P</i> value	Lap	Open	<i>P</i> value	Lap	Open	<i>P</i> value
Number of men who have been sexually active	14	5	/	6	1	/	10	5	/	12	5	/
Sexual enjoyment (functional scale)	40.5 (8.0)	20.0 (8.2)	0.164	38.9 (18.1)	33.3 (/)	1.000	46.7 (7.4)	6.7 (6.7)	0.004	44.4 (10.3)	0 (0.0)	0.019
Male sexual problems (symptom scale)	16.7 (8.4)	0 (0)	0.194	33.3 (13.6)	66.7 (/)	0.309	20.0 (8.5)	76.7 (14.5)	0.013	29.2 (11.3)	80.0 (9.7)	0.026

Quality of life scores are presented as the mean (standard error of mean). Scores ranged from 0 to 100. A higher score on a functional scale indicates better functioning, whereas a higher score on a symptom scale indicates a higher degree of symptoms. Scores in the laparoscopic and open groups were compared by the Mann-Whitney *U* test.

mo after surgery when compared with the open group, but the benefit disappeared at 1 year. The COREAN trial also reported fewer micturition problems in the laparoscopic group when compared with the open group at 3 mo after surgery^[2]. This benefit of less urinary dysfunction is believed to be the result of better preservation of the autonomic nerves and less traumatic surgery, attributable to the magnified view provided by laparoscopic surgery^[2,4,5]. However, when the transient neuropraxia of the pelvic autonomic nerves in the open group has fully recovered, this benefit will disappear.

In our study, male sexual enjoyment and male sexual problems were the only two QoL scales that remained worse in the open group when compared with the laparoscopic group at 1 year after surgery. Yang *et al.*^[29] also reported fewer male sexual problems and better sexual functioning at 12–18 mo after laparoscopic total mesorectal excision for low rectal cancer when compared with open surgery; better sexual enjoyment in the laparoscopic group was even observed after 24 mo postoperatively. By contrast, a nonsignificant trend for worse sexual function in males after laparoscopic surgery for rectal cancer was reported by the United Kingdom Medical Research Council trial of conventional *vs* laparoscopic-assisted surgery in colorectal cancer (CLASICC)^[16]. Interestingly, the design of the CLASICC trial required that every participating surgeon had undertaken at least 20 laparoscopic resections, and most of the surgeons were likely still on their learning curve^[1,31]. Although the laparoscopic approach can provide a clear, magnified view in the deep pelvis, the risk of autonomic nerve injury will still be substantial if the rectal dissection is performed by an inexperienced surgeon.

Similar to the study by Yang *et al.*^[29], our study is limited by its nonrandomized design, and the risk of selection bias is inevitable. Furthermore, the number of sexually active men recruited and analyzed was small, and therefore, a very strong conclusion regarding sexual function after laparoscopic *vs* open surgery for rectal cancer could not be drawn. Nevertheless, based on our findings, we may still conclude that laparoscopic sphincter-preserving resection for rectal cancer is associated with better preservation of QoL and fewer male sexual problems when compared with the open approach in the first year after surgery. Further large-scale, multicenter, randomized trials, including the American College of Surgeons On-

cology Group Z6051 trial and the European COLOR II trial^[32,33], will more definitively evaluate whether laparoscopic surgery truly provides better QoL and reduces urosexual dysfunction in patients with rectal cancer.

In conclusion, this prospective nonrandomized study demonstrates that laparoscopic sphincter-preserving resection for rectal cancer is associated with better preservation of quality of life and fewer male sexual problems when compared with open surgery in Chinese patients. These findings, however, should be interpreted with caution because of the small sample size of the study.

COMMENTS

Background

Most colorectal surgeons are only concerned about the surgical and oncologic safety of laparoscopic surgery for rectal cancer in comparison with the open approach, and many have ignored the importance of functional outcomes and quality of life (QoL). Furthermore, few studies have evaluated QoL outcomes in Chinese patients after laparoscopic surgery for rectal cancer. Authors therefore conducted a prospective study to compare QoL outcomes in Chinese patients after curative laparoscopic *vs* open sphincter-preserving resection for rectal cancer.

Research frontiers

The magnified vision and less traumatic surgery offered by the laparoscopic approach may allow better preservation of the pelvic autonomic nerves, and presumably, functional outcomes following laparoscopic surgery for rectal cancer may be better compared to open surgery. However, conflicting results have been reported in the literature; some studies have even reported a higher incidence of sexual dysfunction after laparoscopic rectal surgery. Furthermore, it is also unclear whether the short-term and long-term clinical benefits associated with the laparoscopic approach will translate into better QoL outcomes for patients with rectal cancer.

Innovations and breakthroughs

This study has several strengths. First, although nonrandomized, the baseline characteristics and sociodemographic data of the two groups of patients were similar, and a fair comparison could therefore be made. Second, other studies have included metastatic cases and abdominoperineal resection in their QoL analysis, whereas the study only focused on Chinese patients undergoing curative sphincter-preserving rectal resection, thus minimizing the impact of other potential confounders on the QoL assessment. Third, all their questionnaires were administered by a single research assistant and were completed by the patients during clinic visits. As a result, authors achieved 100% compliance at different time points, a figure that was not achieved by other studies in which the questionnaires were collected by mail.

Applications

Their prospective nonrandomized study, albeit small in sample size, demonstrates that laparoscopic sphincter-preserving resection for rectal cancer is associated with better preservation of quality of life and fewer male sexual problems when compared with open surgery in Chinese patients. Further large-scale, multicenter, randomized trials, including the American College of Sur-

geons Oncology Group Z6051 trial and the European COLOR II trial, will more definitively evaluate whether laparoscopic surgery truly provides better QoL and reduces urosexual dysfunction in patients with rectal cancer.

Terminology

Within the context of medical and healthcare research, QoL is the patient's subjective perception of the impact of his/her disease and its treatments on his/her physical, psychological, and social functioning and general well-being. Health-related QoL after cancer surgery can be assessed by standardized instruments such as the questionnaires developed by the European Organization for Research and Treatment of Cancer (EORTC), which contain multidimensional generic and disease-specific domains; the EORTC QLQ-C30 and QLQ-CR38 are the most commonly used questionnaires in colorectal cancer trials.

Peer review

The external validity of this study is limited by the fact that only Chinese patients with low body mass index were included, and patients with stage IV disease were excluded.

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P-Reviewer Rutegard J **S-Editor** Gou SX **L-Editor** A
E-Editor Zhang DN





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ISSN 1007-9327



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