

Changes of Quality of Life during the Six Months in the Participants with Lower Rectal Cancer after Sphincter-Saving Surgery: Suggestions for Nursing Care¹⁾

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The objective of this study was to investigate changes in quality of life (QOL) for participants with lower rectal cancer who were treated with sphincter-saving surgery (SSS) over a 6-month period. Participants ($n=78$) completed a self-administered questionnaire before surgery, and at 1 and 6 months post-surgery. The 36-Item Short-Form Survey (SF36) and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire C30/CR38 were used as measurement tools. Qualitative data were collected from participants and their families.

Results indicated that the SF36 physical component summary scores significantly decreased 1 month after surgery, but tended to improve 6 months after surgery without quite recovering to preoperative baselines. SF36 mental component summary scores did not significantly change over time. Overall, it was apparent that participants' hopes, expectations, and experiences were varied and individual, although there were common factors that influenced participants' QOL.

Nurses should consider how participants' QOL might change following SSS for lower rectal cancer and develop their understanding of which factors might influence this outcome.

key words: quality of life, rectal cancer, sphincter-saving surgery, symptoms, nursing care

Introduction

Cancer patients can contribute a unique and much-needed perspective on their own symptom burden and quality of life (QOL; Chantal et al., 2014). Surgery for rectal cancer often results in sexual, urinary, and bowel function disorders, but patients often fail to report such conditions due to a sense of shame. Such dysfunctions may, however, influence patients' QOL.

Rectal cancer is treated by abdominoperineal resection (APR) or sphincter-saving surgery (SSS). In APR, the anus, rectum, and sigmoid colon are resected and a stoma is created on the abdomen. The support needs of patients undergoing APR are of greater concern than are those undergoing SSS, as people are better able to empathize with the major changes of this treatment, including permanent stoma care.

Bryant et al. (2012) reported that up to 80% of patients with rectal cancer undergo SSS because the

development of new surgical techniques has recently made low anastomosis possible. As a result, the demand for SSS has increased among participants with lower rectal cancer.

Moreover, lower anastomosis causes more severe defecation problems, including disturbances in bowel habits that range from increased bowel frequency to fecal incontinence or evacuatory dysfunction. Physicians have different opinions regarding very low anastomosis in SSS. Advocates argue that the avoidance of a permanent stoma improves QOL, while conservatives contest that severe defecation problems reduce QOL.

Lai, Wong and Ching (2013) point out that non-stoma patients with bowel dysfunction have received little attention from nursing professionals. In addition, tolerance to these symptoms may also exist if they are viewed as a small price to pay for cancer treatment (Desnoo & Faithfull, 2006) and avoiding a permanent stoma.

Cochrane reviews attempting to estimate QOL

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following APR and SSS have been controversial (Pachler & Wille-Jørgensen, 2012). Cornish (2007) reported that rectal cancer participants that undergo SSS might experience a different set of symptoms from stoma patients that affect their QOL.

Defecation problems after SSS are most frequent and severe within the first 6 months (Lai, Wong, & Ching, 2013). It is important to support post-surgery patients while they are recovering. Patients are usually discharged within 2–3 weeks after surgery, so they are usually in the early stages of returning to their daily lives at around 1 month after surgery.

Recent longitudinal studies on SSS and QOL using the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire (QLQ-C30) and the colorectal cancer-specific module (QLQ-CR38) of this measure found that the QOL of physical, role, and social functioning and fatigue revealed a substantial deterioration 1 month after surgery for patients recovering from APR and SSS and after 6 months, all QOL baseline scores improved (Andersson et al., 2013). It is essential to support patients throughout their post-surgical recovery, so we plan to assess QOL before surgery, and at 1 and 6 months intervals after surgery.

To our knowledge, there are no existing studies on longitudinal changes in QOL among patients with lower rectal cancer after undergoing only SSS and using the SF36. The normal value of SF36 among Japanese is 50 with a standard deviation of 10, and so this is easy to compare to normal persons. The EORTC QLQ-C30 is a reliable and valid measure of QOL among cancer patients in multicultural clinical research settings (Aaronson et al., 1993). However, as the EORTC QLQ-C30 does not include data from the Japanese general population, we could not compare the results from Japanese patients with normal Japanese. Thus, we aimed to evaluate QOL of our study participants using the SF36.

The purpose of this study was therefore to examine changes in QOL and symptoms using the SF36 and EORTC QLQ-C30/CR38 before and after SSS in participants with lower rectal cancer.

Moreover, we conducted semi-structure interviews with participants and their families post-surgery in order to understand how participants and families feel before and after surgery.

Methods

1. Study population and data collection

The participants in this study were participants with clinical stage I–IIIb cancers who had undergone SSS, were over 20 years of age, and could complete the QOL questionnaires. All participants with lower rectal cancer underwent their primary surgeries at Kyushu University Hospital or Fukuoka Sanno Hospital between November 2008 and March 2013.

Those participants that agreed to participate in the study completed the self-administered questionnaires, which were either mailed or hand-delivered to participants before their surgery and at 1- and 6-month intervals following their operations. Clinical data were gathered from the respective institutional databases. All collected questionnaires were coded and stored in a secure location to protect participants' privacy. In total, 88 participants who had undergone SSS provided written consent, 85 agreed to participate in the study, and 78 completed the entire set (four administrations) of questionnaires.

The variations of SSS include LAR, ultra-low anterior resection (ULAR), and intersphincteric resection (ISR). LAR surgery is commonly used when the middle rectum is affected by cancer, ULAR surgery is LAR with anastomoses 2 cm from the dentate line, and ISR is considered the ultimate SSS for treating very low rectal cancer and incorporates a partial resection of the internal anal sphincter (Schiesel et al., 1994).

2. Questionnaires

1) The Japanese issue of the SF36 version 2.0 (Fukuhara et al., 1988; Fukuhara et al., 1998) is a generic QOL questionnaire that incorporates 2 summary scales: The physical component summary and the mental component summary. Potential scores on each scale range from 0 to 100, where higher scores represent high levels of functioning. We obtained permission to use this questionnaire from iHope International. Cronbach's α was calculated to be 0.83–0.90 for the physical component summary, and 0.85–0.87 for the mental component summary.

2) The Japanese issue of EORTC QLQ-C30 version 3.0 measures QOL and 9 multi-item symptom scales (fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite loss, constipation, diarrhea, and financial difficulties) of participants with cancer (Aaronson et al., 1993; Kobayashi et al., 1998; Fay-

ers, 2001). In this study, we used only symptom scales of EORTC QLQ-C30.

3) The Japanese version of the colorectal cancer-specific module of this measure (EORTC QLQ-CR38; Aaronson et al., 1993; Sprangers et al., 1999; Tsunoda et al., 2007) includes 4 functional scales (body image, sexual functioning, sexual enjoyment, and future perspective), and 8 symptom scales/items (micturition problems, chemotherapy side effects, gastro-intestinal tract symptoms, male sexual problems, female sexual problems, defecation problems, stoma-related problems, and weight loss). We used only 4 of 8 symptom scales/items (micturition problems, gastro-intestinal tract symptoms, defecation problems, and weight loss) that was needed in our study. We obtained permission to use these questionnaires from the EORTC QOL Group. This evaluation technique has been approved for assessing QOL globally, making it appropriate in the assessment of QOL among cancer patients.

3. Statistical methods

The statistical analyses used to score the scales were performed according to the SF36 scoring program, and EORTC questionnaires were evaluated in accordance with the scoring manual (Fayers et al., 2001) and involved the transformation of raw scores to a linear scale ranging from 0 to 100. Data from the follow-up study were analyzed using repeated measures ANOVA (time factor) and the Bonferroni test. This study aimed to include at least 24 participants, a number that would be expected to yield a power $\geq .80$, based on $\alpha \leq .05$, and assuming a medium effect size (i.e., $f = .25$; Cohen, 1977).

Spearman's correlation coefficient was used to examine the ability of the functional and symptoms scales to predict QOL (SF36).

Multiple linear regression analysis (Stepwise) was performed on the independent predictors of EORTC QLQ-C30/CR38 scores. Variables that correlated with QOL ($p < .10$) were included in the Spearman correlations as independent variables that could predict QOL magnitude. Multiple linear regression analysis (Stepwise) was used to identify the independent variables (EORTC QLQ-C30 and CR38) that could predict QOL (dependent variable). The level of statistical significance was set to .05 and SPSS (Version 21.0 for Windows, Tokyo) was used for all statistical analyses.

Table 1 Demographic and rectal cancer-related information

| | <i>n</i> | % |
|---|----------|---------|
| Age (range, years) | 59.28 | (33–78) |
| Gender | | |
| Men | 45 | 57.7 |
| Women | 33 | 42.3 |
| Occupational status | | |
| Employed full or part-time | 32 | 41.0 |
| Unemployed | 46 | 59.0 |
| Marital status | | |
| Married | 75 | 96.2 |
| Other | 3 | 3.8 |
| Living with others | | |
| No | 5 | 6.4 |
| Yes | 73 | 93.6 |
| Clinical stage (tumor node metastasis) | | |
| I | 40 | 51.3 |
| II | 16 | 20.5 |
| IIIa | 12 | 15.4 |
| IIIb | 10 | 12.8 |
| Surgery | | |
| ISR | 16 | 20.5 |
| ULAR | 24 | 30.8 |
| LAR | 38 | 48.7 |
| Chemotherapy | | |
| No | 45 | 57.7 |
| Yes | 33 | 42.3 |
| Radiation | | |
| No | 78 | 100.0 |
| Yes | 0 | 0.0 |

Surgery: ISR (intersphincteric resection); ULAR (ultra low anterior resection); LAR (low anterior resection)

4. Semi-structured interviews

Qualitative data was collected from participants and their families 1, 6, and 12 months after surgery. All interviewees were invited to semi-structured interviews. The interview questions were "How about before surgery?" and "How about after surgery?"

5. Ethical considerations

Ethical approval was obtained from the Kyushu University Review Board (approval number: 26) and Fukuoka Sanno Hospital (approval number: 01).

Results

1. Participants

The mean age of the final sample of 78 was 59.28 years (Table 1).

2. Changes in the QOL (SF36)

The changes in the component summary scores of

Table 2 SF36 2 Component Summary Score

| | Questionnaire Time Points | | | Main Effect on Time (T0, T1, T2) | $\eta^2 p$ |
|-----|------------------------------|-----------------------------|-------------------------|-------------------------------------|------------|
| | Before (T0) Mean \pm SD | Post operative time (month) | | | |
| | | 1 (T1) Mean \pm SD | 6 (T2) Mean \pm SD | | |
| PCS | 45.56 \pm 12.23 | 32.09 \pm 13.97 | 42.35 \pm 13.27 | $p < .001$ T0<T1*** T1>T2*** | .314 |
| MCS | 46.00 \pm 11.71 | 46.80 \pm 11.07 | 48.56 \pm 8.89 | $p < .379$ | .013 |

PCS: Physical Component Summary, MCS: Mental Component Summary

A high score in the functional scales and overall QOL scale represents a high level of function.

* $p < .05$ ** $p < .01$ *** $p < .001$.

Table 3 EORTC QLQ-C30 Symptom scales/Items and CR38 Scores

| | Questionnaire Time Points | | | Main Effect on Time (T0, T1, T2) | $\eta^2 p$ |
|---|------------------------------|-----------------------------|-------------------------|--------------------------------------|------------|
| | Before (T0) Mean \pm SD | Post operative time (month) | | | |
| | | 1 (T1) Mean \pm SD | 6 (T2) Mean \pm SD | | |
| EORTC QLQ-C30v3 Symptom scales/Items (#) | | | | | |
| Fatigue | 25.48 \pm 19.91 | 35.63 \pm 22.19 | 25.48 \pm 16.72 | $p = .000$ T0<T1* T1>T2** | .103 |
| Nausea and vomiting | 1.78 \pm 6.47 | 4.89 \pm 14.44 | 2.22 \pm 7.42 | $p = .038$ | .050 |
| Pain | 17.11 \pm 22.42 | 22.89 \pm 26.39 | 16.22 \pm 23.57 | $p = .077$ | .034 |
| Dyspnea | 10.67 \pm 21.34 | 7.56 \pm 17.82 | 7.11 \pm 17.58 | $p = .322$ | .015 |
| Insomnia | 24.89 \pm 29.56 | 31.56 \pm 32.83 | 24.89 \pm 31.52 | $p = .175$ | .023 |
| Appetite loss | 11.11 \pm 21.46 | 18.67 \pm 31.59 | 11.11 \pm 23.46 | $p = .509$ | .039 |
| Constipation | 31.56 \pm 34.18 | 27.44 \pm 29.18 | 27.56 \pm 28.14 | $p = .557$ | .008 |
| Diarrhoea | 23.11 \pm 23.87 | 23.78 \pm 25.73 | 21.33 \pm 23.66 | $p = .780$ | .003 |
| Financial difficulties | 15.56 \pm 27.58 | 26.78 \pm 29.68 | 17.78 \pm 24.71 | $p = .003$ | .081 |
| EORTC QLQ-CR38 Function scales/Items | | | | | |
| Body image | 83.85 \pm 18.38 | 73.41 \pm 27.30 | 78.67 \pm 20.32 | $p = .003$ T0>T1** | .081 |
| Future perspective | 58.22 \pm 26.90 | 51.00 \pm 34.22 | 59.56 \pm 23.44 | $p = .108$ | .030 |
| Sexual functioning | 18.81 \pm 20.84 | 12.86 \pm 17.76 | 15.48 \pm 18.02 | $p = .026$ | .051 |
| Sexual enjoyment | 45.15 \pm 22.47 | 30.30 \pm 27.70 | 29.39 \pm 25.03 | $p = .240$ | .059 |
| EORTC QLQ-CR38 Symptom scales/Items (#) | | | | | |
| Micturition problems | 15.11 \pm 18.69 | 32.41 \pm 25.36 | 22.22 \pm 17.43 | $p < .001$ T0<T1*** T0<T2* T1>T2* | .205 |
| Symptoms in the area of the gastro-intesti- nal tract | 20.09 \pm 23.47 | 26.27 \pm 24.81 | 18.31 \pm 14.00 | $p = .031$ T1>T2* | .048 |
| Defaecation problems | 19.71 \pm 14.61 | 33.85 \pm 16.73 | 24.60 \pm 11.50 | $p < .001$ T0<T1*** T1>T2*** | .236 |
| Weight loss | 10.22 \pm 17.31 | 24.00 \pm 28.24 | 9.33 \pm 20.18 | $p < .001$ T0<T1*** T1>T2*** | .133 |

A high score in the functional scales and overall QOL scale represents a high level of function, and a high score in the symptoms scales or single items (#) does a high level of symptoms or problems.

* $p < .05$ ** $p < .01$ *** $p < .001$.

Table 4a Correlations between QOL (SF36) and EORTC QLQ-C30 (Symptom scales/items)

| | | Symptom scales/items (#) | | | | | | | | |
|--------------------------|-----|--------------------------|---------------------------|----------|---------|----------|------------------|--------------|-----------|---------------------------|
| | | Fatigue | Nausea and Vomiting | Pain | Dyspna | Insomnia | Appetite loss | Constipation | Diarrhoea | Financial Difficulties |
| Before surgery | PCS | <i>r</i> -.455*** | .064 | -.350** | -.320** | -.390** | -.343** | -.276* | -.107 | -.362** |
| | MCS | <i>r</i> -.581*** | -.064 | -.355** | -.029 | -.525*** | -.284* | .004 | -.227 | -.393*** |
| 1 month after surgery | PCS | <i>r</i> -.705*** | -.296 | -.502*** | -.171 | -.387** | -.411*** | -.054 | -.177 | -.478*** |
| | MCS | <i>r</i> -.560*** | -.060 | -.522*** | -.134 | -.592*** | -.209 | -.164 | -.168 | -.378** |
| 6 month after surgery | PCS | <i>r</i> -.575*** | -.271* | -.508*** | -.205 | -.368** | -.187 | -.356** | -.073 | -.466*** |
| | MCS | <i>r</i> -.362** | -.083 | -.411*** | .012 | -.208 | -.266* | .045 | -.039 | -.302** |

PCS: Physical Component Summary, MCS: Mental Component Summary

A high score in the symptoms scales or single items (#) does a high level of symptoms or problems.

Table 4b Correlations between QOL (SF36) and QLQ-EORTC CR38

| | | Functional scales | | | | Symptom scales/items (#) | | |
|--------------------------|-----|-------------------|-----------------------|-----------------------|-------------------------|---|-------------------------|-------------|
| | | Body image | Future Perspective | Sexual Functioning | Micturition Problems | Symptom in the area of gastrointes- tinal tract | Defaecation Problems | Weight Loss |
| Before surgery | PCS | <i>r</i> .397*** | .124 | .009 | -.121 | -.472*** | -.260* | -.192 |
| | MCS | <i>r</i> .588*** | .383** | .392** | -.008 | -.225 | -.215 | -.119 |
| 1 month after surgery | PCS | <i>r</i> .475*** | .447*** | .268 | -.301** | -.596*** | -.412*** | -.425*** |
| | MCS | <i>r</i> .567*** | .583*** | .162 | -.120 | -.429*** | -.431*** | -.162 |
| 6 month after surgery | PCS | <i>r</i> .367** | .296* | .212 | -.313** | -.440*** | -.426*** | -.092 |
| | MCS | <i>r</i> .442*** | .419*** | .124 | -.101 | -.150 | -.262* | -.177 |

PCS: Physical Component Summary, MCS: Mental Component Summary

A high score in the functional scales and overall QOL scale represents a high level of function, and a high score in the symptoms scales or single items (#) does a high level of symptoms or problems.

the SF36 are shown in Table 2. All of the scores in both components were less than 50 (the control norm-based scoring [NBS]) point. The physical component summary scores deteriorated over 10 points 1 month after surgery, but showed subsequent improvement within 6 months after surgery. The mental summary scores did not drop after surgery. However, their change pattern was various, before surgery (T0) < 1 month after surgery (T1) was 48.7%, and T1 < 6 month after surgery (T2) was 51.2%.

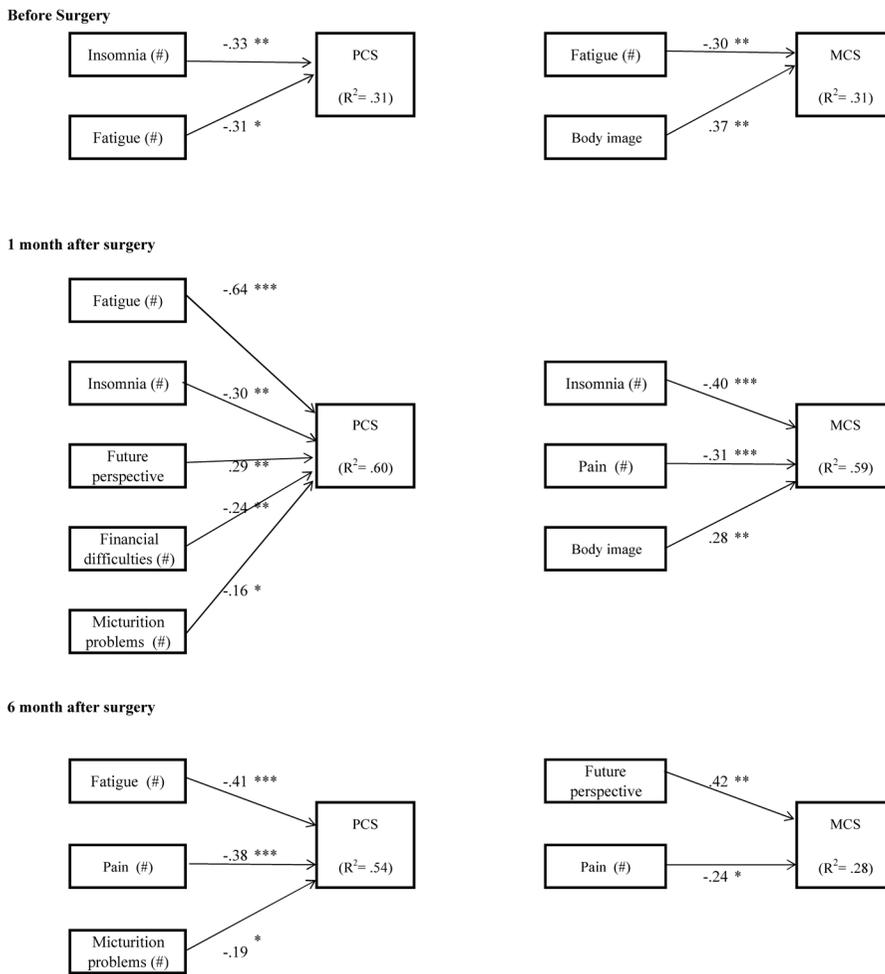
3. Changes in the factors (EORTC QLQ-C30/CR38)

Changes in participants' scores on the EORTC QLQ-C30 and the EORTC QLQ-CR38 are presented in Table 3. Measures of physical symptoms, such as appetite loss and sexual functioning, indicated sig-

nificant improvements. Fatigue, financial difficulties, body image, micturition problems, defecation problems, and weight loss all showed a decline 1 month after surgery. Baseline values for most of these items were much improved 6 months after the operation. Other factors did not change significantly during the 6-month postoperative period.

4. Correlations between QOL (SF36) and factors (EORTC QLQ-C30/CR38)

We analyzed the correlations between QOL (physical and mental component summary scores in the SF36) and EORTC QLQ-C30/CR38 factors (Table 4a, 4b). Over time, a significant negative correlation was found between the component summary scores and fatigue, pain, and financial difficulties. Moreover, a significant positive correlation was found between QOL and body image.



PCS: Physical Component Summary, MCS: Mental Component Summary

A high score in the functional scales and overall QOL scale represents a high level of function, and a high score in the symptoms scales or single items (#) does a high level of symptoms or problems.

Figure 1 Stepwise linear regression analysis for variable predicting Physical and Mental Component Summary Score (SF36)

5. Multiple linear regression analysis (Stepwise) for predicting QOL (SF36)

Stepwise linear regression analyses were conducted in order to identify predictors of physical and mental component summary scores in the SF36 (Figure 1). Pre-surgery, the physical component summary was significantly predicted by insomnia ($\beta = -.33$) and fatigue ($\beta = -.31$) ($F(2, 72) = 25.36$, $p < .001$, Adj. $R^2 = .31$), while the mental component summary was significantly predicted by fatigue ($\beta = -.30$) and body image ($\beta = .37$) ($F(2, 72) = 17.22$, $p < .001$, Adj. $R^2 = .31$). One month after surgery, the physical component was significantly predicted by fatigue ($\beta = -.64$), insomnia ($\beta = -.30$), future per-

spective ($\beta = .29$), financial difficulties ($\beta = -.24$), and micturition problems ($\beta = -.16$) ($F(5, 69) = 23.19$, $p < .001$, Adj. $R^2 = .60$). Mental component summary scores were significantly predicted by insomnia ($\beta = -.40$), pain ($\beta = -.31$), and body image ($\beta = .28$) ($F(3, 71) = 36.42$, $p < .001$, Adj. $R^2 = .59$). Six months after surgery, physical component summary scores were significantly predicted by fatigue ($\beta = -.41$), pain ($\beta = -.38$), and micturition problems ($\beta = -.19$) ($F(3, 71) = 29.41$, $p < .001$, Adj. $R^2 = .54$), while mental component summary scores were significantly predicted by future perspective ($\beta = .42$) and pain ($\beta = -.24$) ($F(2, 72) = 15.35$, $p < .001$, Adj. $R^2 = .54$).

6. Semi-structured interviews

Participant A (high QOL) a 65-year-old male, retired, married, and living with others. Operation: ISR for clinical stage II rectal cancer. After surgery, he said, "When I heard that I had cancer, I hoped to meet nobody. When I heard that I might have a stoma, I felt that I would prefer death. When I heard that I would be able to have an anastomosis, I was very glad and so I did not feel that dyschezia was hard to endure after surgery."

Participant B (high QOL) a 52-year-old male, employed, married, and living with others. Operation: ISR for clinical stage I. One month after surgery, he said, "At one hospital before surgery a physician told me that they would not do SSS as it would require a permanent stoma, however another hospital was willing and I got well. I'm so glad."

Participant C (low QOL) a 72-year-old female, retired, married, and living with others. Operation: ISR for clinical stage I. One month after surgery, she said, "I should have made my decision more carefully. My operation failed. Defecation is a great problem for me. After endoscopic resection I heard that I might have a recurrence, so I received surgery, but ..."

Participant D (low QOL) a 75-year-old male, retired, married, and living with others. Operation: ISR for clinical stage I. One month after surgery he said, "If we have severe defecation problems, human nature is lost, isn't it? I intend to have a permanent stoma if this state continues persistently." Six months after surgery he said, "I told my doctor that I want a permanent stoma. I cannot go out and golf anymore. He said that it is possible, but that he would like to observe a little longer." After this, his defecation problems decreased and his desire to have a permanent stoma disappeared.

Participant D's wife One month after surgery, she called me on holiday and said, "I was able to call because he is going out now. My house resembles a hospital because there are many defecation goods. I am turning away every guest. Moreover, he walks around the house wearing only his diaper because he's afraid of fecal incontinence. He seems to be recovering, but he's depressed and hopes for a stoma."

Discussion

This is the first study to explore longitudinal changes in QOL in participants with lower rectal

cancer by evaluating QOL for 6 months after SSS and incorporating a host of QOL-related factors using the SF36. Little is known about how participants' QOL change over time following SSS, and which factors are most involved in this process. In this study, all scores in both the physical and mental component summaries (SF36) were less than 50 before surgery. Physical component summary scores significantly decreased 1 month after surgery, but successfully recovered within 6 months. Mental summary scores did not, however, change significantly over time, although they did demonstrate various change patterns. Any significant difference may have therefore been canceled out by these individual changes. Moreover, Park and Crystal (2008) described the efforts of cancer survivors to find meaning in their experiences (i.e., posttraumatic growth, find life meaningful, and restore their beliefs in a just world). This, in turn, may have influenced their psychological adjustment.

Andersson et al. (2013) reported that physical, role, and social functioning and fatigue, as measured through the EORTC QLQ-C30/CR38, deteriorated 1 month after surgery but had recovered by 6 months after surgery. This result was similar to our findings in the physical component summary score.

The present study found significant changes in participants' QOL post-surgery and identified the factors associated with this change. Before surgery, all participants demonstrated physical component summary scores of less than 50. In order to improve preoperative scores on this scale, attention should pay to levels of insomnia and fatigue. Pre-surgery, the mental component summary scores were also less than 50, and these scores might be improved by focusing on levels of fatigue and body image. Concerns regarding surgery and their lives in general may cause some participants to suffer from insomnia. Moreover, fatigue is a common problem among cancer patients (Stone & Minton, 2008) and providing informed consent for sexual problems may decrease participants' body image. Participants in our qualitative study may have made up their mind about surgery only 1-2 days prior to surgery, and so it is possible that our data did not take "emotional upset before surgery" into account.

In our study, physical component summary scores significantly decreased 1 month after surgery due to various symptoms. To address this issue,

greater attention should be given to participants' levels of fatigue, insomnia, future perspectives, financial difficulties, and micturition problems. Moreover, 42.3% participants received chemotherapy and the financial stress of this may have impaired QOL. Micturition problems including self-catheterization and frequency of urination and pain while urinating, caused participants to frequently visit the restroom. Future perspectives and financial difficulties may also influence participants' mental and social health. Nurses should pay attention to symptoms of fatigue, insomnia, and micturition problems, and offer psychological support related to participants' future and social support for their financial difficulties. One month after surgery, our sample's mental component summary scores remained under 50, but could be improved by helping participants manage insomnia, pain, and body image. As Konanz et al. (2013) note, incontinence and painful defecation are common problems for these participants. During a post-surgery interview, participant D and his wife indicated that severe defecation problems resulted in many negative mental outcomes.

The physical component summary scores in the present study did in fact significantly rebound 6 months after surgery, but did not fully recover to preoperative levels. In order to aid physical recovery 6 months after surgery, attention should be paid to managing participants' fatigue, pain, and micturition problems continuously.

Six months after surgery, participants' mental component summary scores had not significantly changed and remained under 50. These scores might improve, however, if nurses were to address participants' perceptions of the future and degree of pain. Moreover, in the case of participant D, his experiences and hopes changed over time. Nursing interventions that are time-sensitive would be more able to improve QOL among participants with lower rectal cancer.

It has been argued that researchers should consider "symptom clusters" (Dodd et al., 2001). Cancer participants often experience multiple symptoms, and symptom clusters are defined as two or more concurrent symptoms that are related and may or may not have a common cause. Psycho-educational interventions are among those strategies for managing fatigue (Stone & Minton, 2008), insomnia, pain,

micturition problems, body image, and participants' perspective of the future.

A hypothesis has been proposed that suggests that QOL measures the difference, or the gap, at a particular moment in time between the hopes and expectations of the individual and that individual's present experiences (Calman et al., 1984). Moreover, since expectations regarding health and the ability to cope with limitations and disability can greatly affect a person's perception of health and life satisfaction, two people with the same health status may have very different QOL (Testa & Simonson, 1996). We must recognize the difficulties associated with QOL evaluation.

Therefore, more information about participants' experiences with SSS are needed. The components of any successful support system should include information on coping with fatigue and pain, and psychological support to improve participants' body image and future perspectives, as well as social support to ease any financial difficulties.

The information presented herein provides valuable insight into the predictors of QOL and the factors associated with it. In the future, nurses should consider how QOL might change for postoperative participants and be able to identify those factors that may influence this process. With this knowledge, participants at risk for QOL reduction may be identified and treated accordingly. Moreover, nurses need to understand participants' hopes, expectations, and experiences because they are in a position to influence participants' QOL. For the same reason, nurses should pay attention to the extent to which participants are able to rely on family support.

Study limitations

This study is limited in that it assesses QOL within a 6-month postoperative timespan. Moreover, semi-structure interview data have their own limitations. Engel et al. (2003) reported an improvement in EORTC QLQ-C30 and CR38 scores among rectal cancer participants treated with SSS in a 4-year prospective study. Additional long-term prospective studies will be necessary to further improve QOL in participants suffering from the adverse effects of lower rectal cancer surgeries.

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