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## Quality of life, coping, and psychological and physical symptoms after surgery for non-metastatic digestive tract cancer

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## ABSTRACT

**Objective:** The aim of this study was to investigate the impact of curative surgery for non-metastatic digestive tract cancers on quality of life (QoL), psychological status, and coping strategies.

**Methods:** A prospective, transversal, multicenter study was conducted in 404 patients: 361 with colorectal, 44 with gastroesophageal, and 35 with pancreaticobiliary cancer six months after surgery. Participants completed questionnaires evaluating QoL, including functioning (EORTC-QLC-C30), coping strategies (Mini-MAC), and psychological distress (BSI-18).

**Results:** The effects of surgery had a strong impact on functional domains, global QoL, and symptoms, especially in pancreaticobiliary and gastroesophageal cancer. Patients with pancreaticobiliary and gastroesophageal cancer had lower functional scale scores than those with colorectal cancer. Fatigue, appetite loss, diarrhea, depression, and psychological distress were the most common symptoms after surgery. Subjects with pancreaticobiliary cancer reported more fatigue, pain, insomnia, depression, somatization and psychological distress, whereas individuals with gastroesophageal cancer exhibited more fatigue, nausea/vomiting, diarrhea, depression, psychological distress, and helplessness than those with colorectal cancer. Only participants with colorectal cancer displayed improved QoL six months post-surgery, albeit their psychological state had worsened.

**Conclusion:** Surgeons should discuss expectations regarding symptoms and QoL with patients prior to surgery to minimize physical and psychological impact.

### 1. Introduction

Though generally poor (< 40%), the 5-year survival rate for patients with esophageal, gastric, and biliopancreatic cancer has improved during the past decade and long-term survival is increasing for cases of early or locally-advanced disease [1]. The rationale for complementary chemotherapy is based on the risk of recurrence associated with tumor stage. While chemotherapy is an important element to enhancing survival in resectable stage III and some stage II colorectal cancers [2], the effect of adjuvant chemotherapy on long-term survival

in gastro-esophageal and pancreaticobiliary cancers, which entail a worse prognosis, is variable and less certain [3,4].

Surgery for non-metastatic digestive cancers is the only curative treatment. However, acute complications, such as wound dehiscence and infections, and chronic complications, for instance indigestion, malabsorption, and malnutrition, occur in more than 70% of the cases and are severe in up to 30% [3–5]. These complications negatively impact health-related quality of life (QoL) [6–8], provoking a sense of loss of control that, in turn, generates anxiety, psychological distress, and fear of the future [9], compromising both adjuvant treatment and

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survival [4,5,10].

Most of the information previously referred to is based on studies that are not robust due to their small sample size and retrospective design. In this study, we attempt to prospectively explore the affect surgical resection with curative intent for digestive tract cancer on QoL and the factors that diminish QoL.

## 2. Material and methods

### 2.1. Study design and participants

NEO coping is a prospective, cross-sectional, multicenter study promoted by the Continuing Care Group of the Spanish Society of Medical Oncology (SEOM) and carried out in sixteen Spanish medical oncology departments from June 2015 to June 2018. Patients over 18 years with resected non-metastatic digestive tract cancer and candidates for adjuvant chemotherapy were included consecutively. Subjects who had received preoperative chemotherapy and radiotherapy were excluded. Cancers were grouped by tumor origin into: 1) esophagus and stomach; 2) pancreas and bile duct, and 3) colon and rectum. The study was approved by the Ethics Committees of each center and by the Spanish Agency of Medicines and Medical Devices (AEMPS) and all participants signed informed consent forms prior to inclusion. The study consists of self-report scales that patients completed before starting complementary chemotherapy (in the month following surgery) and at the end of adjuvant treatment (about six months after surgery).

### 2.2. Variables and measures

Patient and tumor characteristics were obtained from the interview and clinical history. The following variables were compiled: gender, age, body mass index (BMI), marital status, education level, employment status, tumor stage, time between diagnosis and surgery, time from surgery to chemotherapy, and type of surgery. Comorbidities were self-reported (alcoholism, heart disease, peripheral vascular disease, cerebrovascular disease, hypertension, diabetes, chronic lung disease, chronic liver disease, chronic kidney failure) with a dichotomous response option (yes/no).

Patients completed QoL and psychological questionnaires, including functioning (EORTC-QLC-C30), coping strategies (M-MAC), and psychological distress (BSI-18).

The European Organization for Research and Treatment of Cancer QoL questionnaire instrument (EORTC QLQ-C30) [11] contains 30 items grouped into five functional scales (physical, role, cognitive, emotional, and social), three symptom scales (fatigue, pain, and nausea and vomiting), a global health status/QoL scale, and a number of single items assessing additional symptoms commonly reported by cancer sufferers (dyspnea, loss of appetite, insomnia, constipation, and diarrhea), and perceived financial impact of the disease. Scores for each item range from 0 to 100. Higher functional scale and global health status scores and lower symptoms scale scores indicate better QoL (in this sample  $\alpha = 0.85$ ).

The Mini-Mental Adjustment to Cancer (M-MAC) [12] contains 29-items categorized into five coping strategies: fighting spirit, helplessness, anxious preoccupation, fatalism, and cognitive avoidance subscales (Cronbach's alpha were 0.80–0.79 in this sample).

The Brief Symptom Inventory (BSI-18) [13] includes 18 items arranged into three dimensions 1) *Somatization*, or distress caused by the perception of bodily dysfunction, 2) *Depression*, which includes dysphoric mood, anhedonia, and self-deprecation, and 3) *Anxiety*, namely symptoms of nervousness, tension, and apprehension (in this sample,  $\alpha = 0.86$ ).

### 2.3. Statistical analyses

Descriptive statistics are reported for demographic and clinical information. Independent t-tests compared differences for continuous variables. Chi-square was used to test disparities in proportions. For each subscale of the EORTC QLQ-C30, M-MAC, and BSI-18, we examined patient scores based on tumor origin using generalized linear models. Bonferroni post-hoc tests were conducted for multiple comparisons of group means. Paired sample t-tests appraised changes in QoL and BSI-18 subscales from the post-surgery visit and six months later (at the end of adjuvant treatment). The level of significance was set at  $p < 0.05$ . Statistical analyses were performed with Statistical Package for Social Sciences (SPSS) software (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp.).

## 3. Results

### 3.1. Patient characteristics

A total of 486 individuals were identified as candidates for surgical resection, of whom 440 agreed to participate in the study. Of these, 361 had colorectal; 44, gastroesophageal, and 35, pancreaticobiliary cancer. Thirty were ineligible to participate (10 failed to meet inclusion criteria; 12 met exclusion criteria, and 8 had incomplete data at the time of this analysis).

Table 1 displays the sample's baseline characteristics. Demographic and family characteristics, sex, age, education, and marital status were similar across the three groups. No significant differences were found in comorbidities, stage, or time between onset of symptoms and diagnosis, interval from diagnosis to surgery or from surgery to chemotherapy. Likewise, no differences were detected in BMI prior to surgery, albeit more pronounced post-operative weight loss was observed in subjects with gastroesophageal cancer. A total of 23 (5.6%) of the patients were treated with SSRIs for depression; 20 (4.9%) were taking benzodiazepines for anxiety syndrome, and 51 (12.4%) were receiving psychological counseling. We found no differences in psychological approach depending on the type of cancer.

Significant differences were noticed with respect to type of resection (Tables 1 and 2). Weight loss was found in 51.8% ( $n = 187$ ) of colorectal cancer patients, 60.6% ( $n = 20$ ) of pancreaticobiliary cancer patients, and 79.5% ( $n = 35$ ) of gastroesophageal cancer patients with significant intergroup differences ( $\chi^2 = 52.234$ ,  $p < 0.001$ ). Individuals with gastric cancer were more likely to undergo total resection (29.3%,  $\chi^2 = 48.184$ ,  $p < 0.001$ ) compared to people with colorectal (2.9%) or pancreaticobiliary cancer (3.7%). Patients with gastroesophageal cancer received more postoperative chemoradiation therapy than the other two tumor groups ( $\chi^2 = 128.238$ ,  $p < 0.001$ ), and multidisciplinary committees tended to be less involved in decisions regarding adjuvant treatment in these cases ( $\chi^2 = 8.003$ ,  $p = 0.018$ ).

### 3.2. Functional status, global quality of life, and symptoms after surgery

In the immediate postoperative period, participants suffered significantly impaired emotional and social function, as well as global QoL, scoring  $< 70$  out of 100 (Figure 1a). Fatigue, loss of appetite, and diarrhea were the most common disease-specific symptoms reported by subjects in the immediate postoperative period with scores of 38–53 (Figure 1b).

In multivariable analyses, statistically significant differences in global QoL, function scales, and six symptom scales were revealed based on tumor origin, with worse scores in patients with pancreaticobiliary and gastroesophageal cancer than in those with colorectal cancer. Pancreaticobiliary cancer was associated with lower scores on physical ( $p = 0.002$ ), emotional ( $p = 0.008$ ), and social function ( $p = 0.001$ ) than colorectal cancer (Table 2). Similarly, individuals with

**Table 1**  
Baseline characteristics according to the location of the cancer.

| Characteristics  | Colorectal n (%) | Pancreaticobiliary n (%) | Gastroesophageal n (%) | p-value      |
|--|------------------|--------------------------|------------------------|--------------|
| <b>Gender (men)</b>  | 120 (33.2)       | 13 (37.1)                | 15 (34.1)              | 0.895        |
| <b>Age, mean (sd)</b>                                      | 63.7 (11.3)      | 63.4 (10.9)              | 67.6 (10.1)            | 0.875        |
| <b>Body mass index (BMI)</b>                               | 26.1 (4.3)       | 24.8 (3.6)               | 25.6 (4.2)             | 0.224        |
| <b>Weight loss</b>   |                  |                          |                        |              |
| No   | 174 (48.2)       | 15 (42.9)                | 9 (20.5)               | <b>0.001</b> |
| Yes, 1–5 kg  | 82 (22.8)        | 1 (2.9)                  | 6 (13.6)               |              |
| Yes, 6–10 kg   | 69 (19.1)        | 10 (28.5)                | 11 (25.0)              |              |
| Yes, 11–15 kg  | 28 (7.7)         | 5 (14.3)                 | 10 (22.7)              |              |
| Yes, more 15.1 kg  | 8 (2.2)          | 4 (11.4)                 | 8 (18.2)               |              |
| <b>Marital Status (married)</b>                            | 266 (79.2)       | 22 (73.3)                | 32 (82.1)              | 0.668        |
| <b>Education (high school)</b>                             | 38 (11.3)        | 4 (13.3)                 | 4 (10.3)               | 0.922        |
| <b>Work (retired)</b>                                      | 232 (69)         | 22 (73.3)                | 28 (71.8)              | 0.846        |
| <b>Comorbidities</b>                                       |                  |                          |                        |              |
| Alcoholism   | 12 (3.3)         | –                        | 3 (6.8)                | 0.247        |
| Heart disease  | 39 (10.8)        | 2 (5.7)                  | 7 (15.9)               | 0.349        |
| Peripheral vascular disease                                | 13 (3.6)         | 3 (8.6)                  | 1 (2.3)                | 0.293        |
| Cerebrovascular disease                                    | 12 (3.3)         | 2 (5.7)                  | 2 (4.5)                | 0.728        |
| Hypertension   | 164 (45.4)       | 19 (54.3)                | 19 (43.2)              | 0.562        |
| Diabetes mellitus  | 69 (19.1)        | 9 (25.7)                 | 6 (13.6)               | 0.398        |
| Chronic lung disease                                       | 22 (6.1)         | 2 (5.7)                  | 1 (2.3)                | 0.586        |
| Chronic liver disease                                      | 13 (3.6)         | 2 (5.7)                  | 3 (6.8)                | 0.525        |
| Chronic kidney failure                                     | 6 (1.7)          | –                        | –                      | 0.514        |
| <b>Tumor stage</b>   |                  |                          |                        | 0.107        |
| II   | 111 (30.8)       | 16 (48.5)                | 10 (29.5)              |              |
| III  | 249 (69.2)       | 17 (51.5)                | 31 (70.5)              |              |
| <b>Time since symptoms to diagnosis-days-, mean (sd)</b>   | 117.3 (23.4)     | 68.0 (81.9)              | 119.8 (177.1)          | 0.568        |
| <b>Time since diagnosis to surgery-days-, mean (sd)</b>    | 132.1 (140.3)    | 88.5 (70.5)              | 130.3 (164.4)          | 0.344        |
| <b>Time since surgery to chemotherapy-days-, mean (sd)</b> | 44.6 (21.1)      | 3.6 (19.3)               | 46.1 (18.8)            | 0.866        |
| <b>Type of organ resection</b>                             |                  |                          |                        | <b>0.001</b> |
| Total  | 10 (2.9)         | 1 (3.7)                  | 12 (29.3)              |              |
| Partial  | 332 (97.1)       | 26 (96.3)                | 29 (70.7)              |              |
| <b>Treatment decided in multidisciplinary committee</b>    | 173 (48.2)       | 17 (48.6)                | 11 (25.6)              | <b>0.018</b> |
| <b>Adjuvant treatment</b>                                  |                  |                          |                        | <b>0.001</b> |
| Chemotherapy   | 346 (96.1)       | 27 (77.1)                | 18 (40.9)              |              |
| Chemo. and radiotherapy                                    | 14 (3.9)         | 8 (22.9)                 | 26 (59.1)              |              |

Abbreviations: Sd, standard deviation.

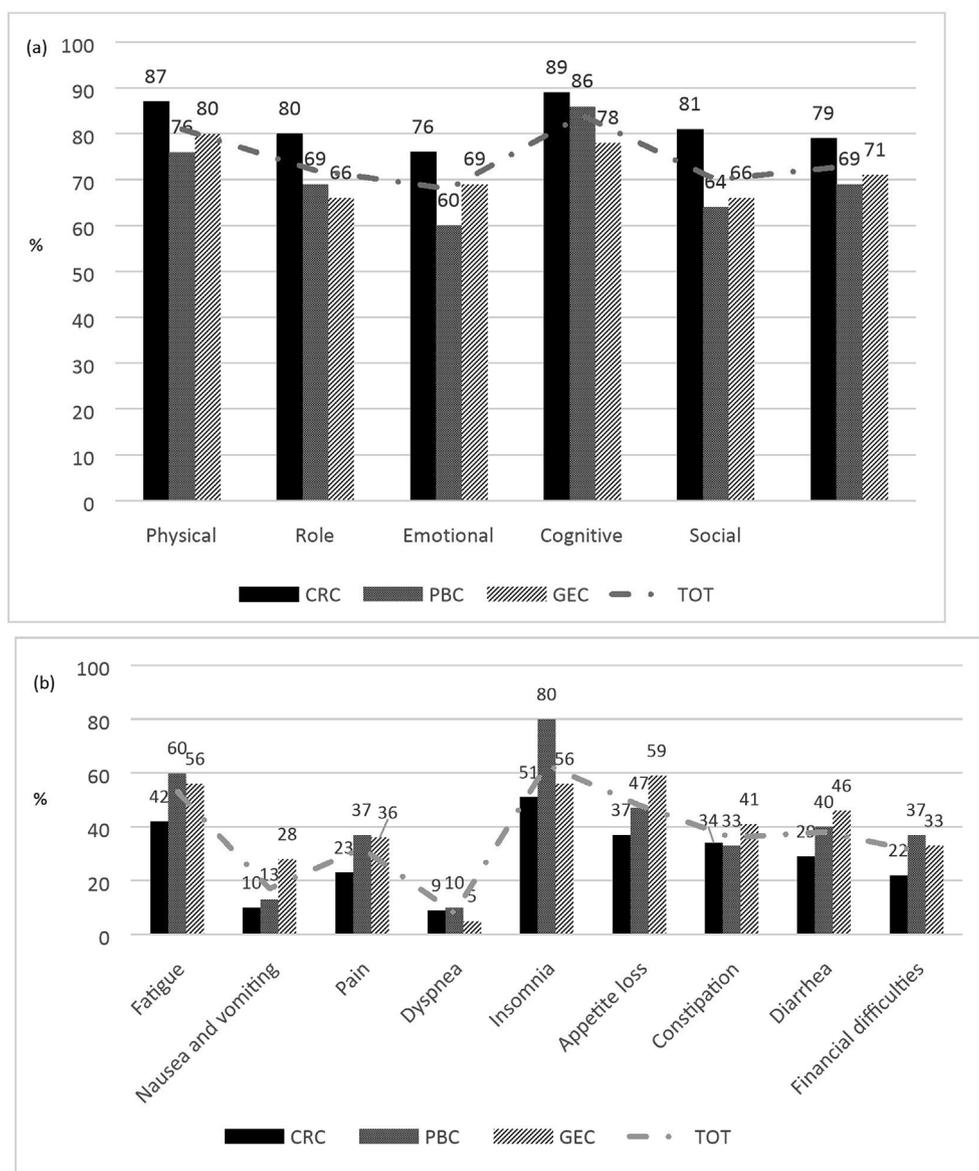
gastroesophageal cancer exhibited lower scores on role ( $p = 0.004$ ), cognitive ( $p = 0.003$ ), social domain ( $p = 0.002$ ), and global QoL ( $p = 0.049$ ) than participants with colorectal cancer (Table 3).

As for symptom scales, people with resected pancreaticobiliary cancer experienced significantly more fatigue (60 vs 42,  $p = 0.001$ ),

pain (37 vs 23,  $p = 0.044$ ), and insomnia (41 vs 26,  $p = 0.044$ ) than those with resected colorectal cancer (Table 3 and Figure 1b). Individuals with resected gastroesophageal cancer suffered significantly greater fatigue (56 vs 42,  $p = 0.017$ ), nausea/vomiting (28 vs 10,  $p = 0.001$ ), diarrhea (46 vs 29,  $p = 0.005$ ), and loss of appetite (59 vs

**Table 2**  
Surgical details according to the cancer site.

| Characteristics                              | Colorectal n (%) 342 (100%) | Pancreaticobiliary n (%) 27 (100%) | Gastroesophageal n (%) 41 (100%) |
|--|-----------------------------|------------------------------------|----------------------------------|
| <b>Type of surgery</b>                       |                             |                                    |                                  |
| Hemicolectomy                                | 319 (94.5)                  | –                                  | –                                |
| Subtotal colon resection                     | 13 (3.6)                    | –                                  | –                                |
| Pan-proctocolectomy                          | 10 (2.9)                    | –                                  | –                                |
| Pancreaticoduodenectomy                      | –                           | 20 (74.1)                          | –                                |
| Distal pancreatectomy and splenectomy        | –                           | 3 (11.1)                           | –                                |
| Total pancreatectomy                         | –                           | 1 (3.7)                            | –                                |
| Cholecystectomy                              | –                           | 3 (11.1)                           | –                                |
| Distal gastrectomy                           | –                           | –                                  | 14 (34.1)                        |
| Subtotal gastrectomy/Esophagectomy           | –                           | –                                  | 15 (36.6)                        |
| Total gastrectomy                            | –                           | –                                  | 12 (29.3)                        |
| <b>Laparoscopy</b>                           | 259 (72.1)                  | 4 (14.7)                           | 7 (15.9)                         |
| <b>Postoperative local complications</b>     | 51 (14.5)                   | 8 (22)                             | 11 (25.6)                        |
| Infection                                    | 28 (8.4)                    | 5 (18.4)                           | 9 (27.2)                         |
| Dehiscence                                   | 9 (2.8)                     | 1 (3.7)                            | 6 (14.6)                         |
| Fistula                                      | 6 (1.7)                     | 3 (11.1)                           | 4 (10.3)                         |
| Paresis or intestinal occlusion (> 48 h)     | 26 (7.2)                    | 2 (7.4)                            | 3 (6.8)                          |
| <b>Postoperative systemic complications</b>  | 42 (11.7)                   | 9 (25.7)                           | 12 (29.3)                        |
| Infection                                    | 22 (6.1)                    | 6 (22.2)                           | 6 (14.6)                         |
| Sepsis                                       | 13 (3.6)                    | 4 (14.7)                           | 4 (10.3)                         |
| Respiratory problems                         | 19 (5.4)                    | 3 (11.1)                           | 6 (14.6)                         |
| Thrombosis                                   | 13 (3.6)                    | 3 (11.1)                           | 6 (14.6)                         |
| Pulmonary embolism                           | 3 (1)                       | 2 (7.4)                            | 3 (6.8)                          |
| <b>ERAs programs for patient's education</b> | 236 (69.2)                  | 14 (54.3)                          | 25 (56.8)                        |



**Figure 1.** Functional state, health status (a) and physical symptoms (b) after surgery

37,  $p = 0.001$ ) than those who had undergone surgery for colorectal cancer (Table 3 and Figure 1b).

### 3.3. Coping strategies, quality of life, and psychological status after surgery

After surgery, patients' psychological status suffered significant deterioration (Figure 2a). The most commonly used coping strategies were fighting spirit and avoidance (Figure 2b).

In multivariable analyses, statistically significant differences were seen in somatization, depression, psychological distress, and helplessness based on tumor origin. Patients with pancreaticobiliary cancer had more symptoms of somatization ( $p = 0.021$ ), depression ( $p = 0.001$ ), and psychological distress ( $p = 0.003$ ) than those with colorectal cancer, whereas participants with gastroesophageal cancer displayed more depression ( $p = 0.001$ ), psychological distress ( $p = 0.023$ ), and helplessness ( $p = 0.045$ ) than those with colorectal cancer (Table 4).

At six months post-surgery, individuals with colorectal cancer experienced the greatest improvement in QoL and psychological status as regards functional status (physical:  $M = 3.7$ ,  $p < 0.005$ ; emotional:  $M = 4.3$ ,  $p < 0.006$ , and social:  $M = 4.1$ ,  $p < 0.026$ ), symptoms

(fatigue:  $M = -5.2$ ,  $p < 0.005$ ; nausea/vomiting:  $M = -3.7$ ,  $p < 0.024$ ; constipation:  $M = -5.2$ ,  $p < 0.021$ , and diarrhea:  $M = -7.3$ ,  $p < 0.002$ ) (Table 4). However, their psychological status at 6 months, coinciding with completion of adjuvant chemotherapy, had worsened (somatization:  $M = -4.1$ ,  $p < 0.001$ ; depression:  $M = -0.9$ ,  $p < 0.009$ , and psychological distress:  $M = -1.6$ ,  $p < 0.001$ ). At this same time point, subjects with gastroesophageal cancer reported more psychological symptoms ( $M = -3.6$ ,  $p < 0.009$ ) and those with pancreaticobiliary cancer exhibited more functional symptoms ( $M = -18$ ,  $p < 0.010$ ).

## 4. Discussion

This prospective study of 440 individuals who had undergone surgery for resectable, non-metastatic, digestive tract cancer has yielded findings that are pertinent to how these people are managed in clinical practice. As part of the informed consent process, surgeons must analyze with their patients how they can expect to feel following surgery. This has typically been done using vague, qualitative language. This study provides quantitative QoL measure that both surgeons and patients understand and can be easily integrated into the decision-making

**Table 3**

Comparison of quality of life between patients who underwent surgery; pairwise comparisons are only displayed for domains with a significant finding on overall comparison.

| DOMAINS                           | Overall comparison (p value) | Effect size $\eta^2$ | Pairwise Comparisons (p value)          |   |                                       |
|-----------------------------------|------------------------------|----------------------|---|---|---------------------------------------|
|                                   |                              |                      | Colorectal vs pancreaticobiliary cancer | Pancreaticobiliary vs gastroesophageal cancer | Colorectal vs gastroesophageal cancer |
| <b>Functional Domains</b>         |                              |                      |   |   |                                       |
| Physical                          | <b>0.001</b>                 | <b>0.042</b>         | <b>0.002</b>                            | 0.816   | 0.056                                 |
| Role                              | <b>0.001</b>                 | <b>0.036</b>         | 0.155                                   | 1.00  | <b>0.004</b>                          |
| Emotional                         | <b>0.007</b>                 | <b>0.027</b>         | <b>0.008</b>                            | 0.430   | 0.526                                 |
| Cognitive                         | <b>0.004</b>                 | <b>0.030</b>         | 1.00                                    | 0.311   | <b>0.003</b>                          |
| Social                            | <b>0.001</b>                 | <b>0.058</b>         | <b>0.001</b>                            | 1.00  | <b>0.002</b>                          |
| <b>Health Status/QoL</b>          | <b>0.007</b>                 | <b>0.026</b>         | 0.073                                   | 1.00  | <b>0.049</b>                          |
| <b>Symptom domains</b>            |                              |                      |   |   |                                       |
| Fatigue                           | <b>0.001</b>                 | <b>0.052</b>         | <b>0.001</b>                            | 0.833   | <b>0.017</b>                          |
| Nausea/vomiting                   | <b>0.001</b>                 | <b>0.032</b>         | 1.00                                    | 0.246   | <b>0.001</b>                          |
| Pain                              | <b>0.037</b>                 | <b>0.017</b>         | <b>0.044</b>                            | 0.671   | 0.934                                 |
| Dyspnea                           | 0.567                        | –                    | –                                       | –   | –                                     |
| Insomnia                          | <b>0.039</b>                 | <b>0.015</b>         | <b>0.044</b>                            | 0.652   | 0.979                                 |
| Appetite loss                     | <b>0.001</b>                 | <b>0.041</b>         | 0.175                                   | 0.936   | <b>0.001</b>                          |
| Constipation                      | 0.972                        | –                    | –                                       | –   | –                                     |
| Diarrhea                          | <b>0.003</b>                 | <b>0.020</b>         | 0.353                                   | 1.00  | <b>0.005</b>                          |
| Financial diffic.                 | <b>0.021</b>                 | <b>0.019</b>         | 0.081                                   | 1.00  | 0.180                                 |
| <b>BSI-18 psychological scale</b> |                              |                      |   |   |                                       |
| Somatization                      | <b>0.005</b>                 | <b>0.028</b>         | <b>0.021</b>                            | 1.00  | 0.109                                 |
| Depression                        | <b>0.001</b>                 | <b>0.069</b>         | <b>0.001</b>                            | 1.00  | <b>0.001</b>                          |
| Anxiety                           | 0.205                        | –                    | –                                       | –   | –                                     |
| Psychol. distress                 | <b>0.001</b>                 | <b>0.043</b>         | <b>0.003</b>                            | 1.00  | <b>0.023</b>                          |
| <b>M-MAC coping strategies</b>    |                              |                      |   |   |                                       |
| Fighting spirit                   | 0.633                        | –                    | –                                       | –   | –                                     |
| Helplessness                      | <b>0.007</b>                 | <b>0.026</b>         | 0.085                                   | 1.00  | <b>0.045</b>                          |
| Anxiety precoc.                   | 0.080                        | –                    | –                                       | –   | –                                     |
| Fatalism                          | 0.195                        | –                    | –                                       | –   | –                                     |
| Cognitive avoid.                  | 0.053                        | –                    | –                                       | –   | –                                     |

Abbreviations: QoL, quality of life.

**Table 4**

Changes in quality of life and psychological status between post-surgery visit and six months later; only domains with a significant finding after surgery are displayed.

| DOMAINS                        | Colorectal cancer (n = 207) |         | Pancreaticobiliary cancer (n = 18) |         | Gastroesophageal cancer (n = 31) |         |
|--------------------------------|-----------------------------|---------|------------------------------------|---------|----------------------------------|---------|
|                                | DIF                         | p value | DIF                                | p value | DIF                              | p value |
| <b>Functional domains</b>      |                             |         |                                    |         |                                  |         |
| Physical                       | 3.7                         | 0.005   |                                    |         |                                  |         |
| Emotional                      |                             |         | –18.0                              | 0.010   |                                  |         |
| Cognitive                      | 4.3                         | 0.006   |                                    |         |                                  |         |
| Social                         | 4.1                         | 0.026   |                                    |         |                                  |         |
| <b>Symptom domains</b>         |                             |         |                                    |         |                                  |         |
| Fatigue                        | –5.2                        | 0.005   |                                    |         |                                  |         |
| Nausea/vomiting                | –3.7                        | 0.024   |                                    |         |                                  |         |
| Constipation                   | –5.2                        | 0.021   |                                    |         |                                  |         |
| Diarrhea                       | –7.3                        | 0.002   |                                    |         |                                  |         |
| <b>BSI psychological scale</b> |                             |         |                                    |         |                                  |         |
| Somatization                   | –4.1                        | 0.001   |                                    |         | –3.6                             | 0.009   |
| Depression                     | –0.9                        | 0.009   |                                    |         |                                  |         |
| Psychol. distress              | –1.6                        | 0.001   |                                    |         |                                  |         |

Abbreviations: DIF, differences between variables after surgery and 6 months later.

process.

In the immediate postoperative period, participants suffered significant impairment of their emotional and social function, and global QoL. Individuals with pancreaticobiliary and gastroesophageal cancer scored lower on the functional scale than did those with colorectal cancer. Fatigue, loss of appetite, and diarrhea were the most prevalent symptoms among all participants and should therefore receive special

attention following surgery. Specifically, pancreaticobiliary cancer sufferers presented more fatigue, pain, and insomnia than those with colorectal cancer, while patients with gastroesophageal cancer displayed more fatigue, nausea/vomiting, and diarrhea than those with colorectal cancer. These results are in line with several studies that have examined QoL after tumor resection [8,14,15], concluding that most individuals exhibit significant decline in this area following curative surgery [14]. This downturn was less pronounced in subjects who underwent a subtotal resection, revealing better functional status, less nausea/vomiting, and less loss of appetite than those in whom a broad or total organ resection was performed [15].

This study also sheds light on surgical cases' psychological status and coping. People with pancreaticobiliary cancer reported more somatic complaints, depression, and psychological distress than those with colorectal cancer, while participants with gastroesophageal cancer suffered more depression, psychological distress, and hopelessness than cases of colorectal cancer. Since surgical approach is tumor-specific, the impact of the intervention on psychological status and coping differs depending on the tumor. Understanding these differences can help surgeons to provide useful, personalized advice to their patients to relieve their uncertainty surrounding possible side effects and to adjust their expectations about wellbeing following surgery.

Two studies have prospectively examined QoL in individuals before and after gastrectomy due to cancer using the EORTC modules. Kobayashi and colleagues reported on 98 patients who underwent gastrectomy [7] and, similar to our results, the authors concluded that QoL declined during the immediate postoperative period. Approximately six months after surgery, patients recovered their preoperative functional status. Most of the procedures in this study were distal gastrectomy, with only eight cases of total gastrectomy. As a result, the authors were unable to draw solid conclusions about the impact the degree of resection on QoL. In a comparable study, Avery and col.

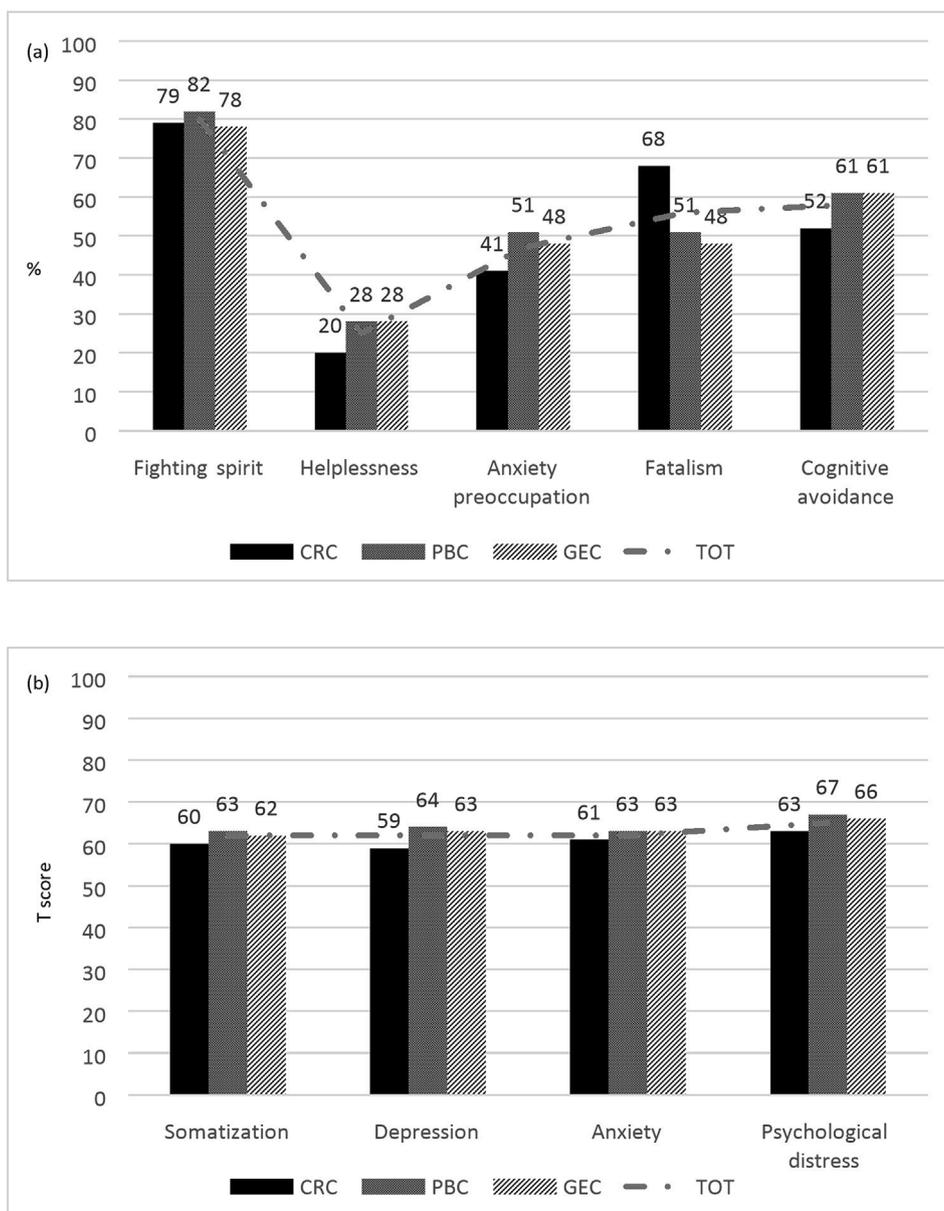


Figure 2. Psychological status (a) and coping strategies (b) after surgery

followed up on 58 individuals who had a total or subtotal gastrectomy for two years after the operation [10]. Akin to our findings, their cases experienced a significant decline in QoL during the postoperative period that returned to baseline in most cases six months post-intervention. However, in our study, the improvement evidenced in functional status and symptoms at six months was only significant in participants with colorectal cancer, but not in those with pancreaticobiliary or gastroesophageal cancer. Despite this physical and functional gain, subjects with colorectal cancer felt worse psychologically.

This study has several strengths. It is a multicenter study, with a large, homogenous sample of consecutive patients following curative resection of a non-metastatic digestive tract cancer suitable for adjuvant chemotherapy. Data regarding QoL, psychological status, and coping were prospectively collected, thereby enabling us to achieve results that were representative of people with cancers with similar prognoses and undergoing this kind of intervention. The QoL, psychological status, and coping data collected at the first postoperative visit made it possible to compare different variables that affect physical and

psychological wellbeing in individuals with different digestive tumors. Likewise, gathering information about these same variables six months after surgery and coinciding with the end of adjuvant chemotherapy has enabled us to analyze variation over time.

Our study also has certain limitations that must be taken into account. Participants were studied after surgery; hence, we cannot establish the precise causal relationship of the variables examined. It is likely that some cases already had some kind of alteration to begin with as a result of the tumor itself. It would therefore be interesting for further research to obtain information prior to surgery so as to be able to compare patients' pre- and post-operative status. Individuals who were eligible for adjuvant chemotherapy were included; consequently, subjects who were impaired as a result of the tumor or surgery, fragile patients, and those in advanced or metastatic stages were not assessed.

### 5. Conclusion

In conclusion, this study has shed light on the effects of surgery in individuals with non-metastatic, digestive tract cancer eligible for

adjuvant chemotherapy. The effects of surgery impacted QoL, functional status, and psychological status tremendously, as well as increasing symptoms, especially in cases of pancreaticobiliary and gastroesophageal cancer. Participants with colorectal cancer were the ones who had fewer symptoms following surgery and improved physical and functional symptoms with worse psychological symptoms six months post-surgery. These results reveal the effect of surgery physically, psychologically, and on QoL, which can help surgeons to inform their patients about the potential effects of the intervention and aid oncologists in supporting recovery, coinciding with treatment with adjuvant chemotherapy.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.suronc.2019.08.009>.

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