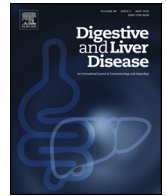




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### Oncology

# Effects of age after laparoscopic right colectomy for cancer: Are there any specific outcomes?

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#### ABSTRACT

**Background:** Laparoscopic approach in colorectal surgery has demonstrated to give advantages in terms of postoperative outcomes, particularly in high-risk patients. The aim was to assess the impact of patients' age on the short-term outcomes after laparoscopic right colectomy for cancer.

**Methods:** From January 2004 to September 2014, all patients who underwent laparoscopic right colectomy for cancer in a single institution were divided into four groups (A: <64 years; B: 65–74 years; C: 75–84 years; D ≥85 years). Risk factors for postoperative complications were determined on multivariable analysis.

**Results:** Laparoscopic right colectomy was performed in 507 patients, including 171 (33.7%) in A, 168 (33.1%) in B, 131 (25.8) in C and 37 (7.4%) in D. Patients in Group C and Group D had higher ASA score ( $p < 0.0001$ ) and presented more frequently with anaemia (20.6% and 29.7%,  $p = 0.001$ ). Stages III and IV were more frequently encountered in groups C and D. Overall morbidity was 27.5% without any difference in the four groups (24.5%, 29.1%, 7.5% and 18.4% respectively,  $p = 0.58$ ). The rate of minor complications (such as wound infection or postoperative ileus) was higher in Group D compared to other groups ( $p = 0.05$ ). The only independent variable correlated with postoperative morbidity was intraoperative blood transfusion (OR 2.82; CI 95% 1.05–4.59,  $p < 0.0001$ ).

**Conclusions:** The present series suggests that patient's age did not significantly jeopardize the postoperative outcomes after laparoscopic right colectomy for cancer.

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#### 'What does this paper add to the literature?'

This is the first study comparing short-term outcomes of elderly patients undergoing a laparoscopic right colectomy for cancer. This series emphasizes that patient's age did not influence the outcomes after laparoscopic right colectomy for cancer.

#### 1. Introduction

Nearly 9% of the French population was older than 75 years in 2010 and the population older than 80 years has increased during the last century [1]. Therefore, the treatment of elderly patients with colorectal cancer (CRC) has emerged as an important consideration given the aging population. Advanced age is usually considered as a risk factor for surgery, potentially associated

with higher rate of major postoperative complications and direct operative mortality. This increased risk is attributed to an age-related decline in physical function and reserve capacity associated with the increased presence of various comorbidities [2]. Therefore, careful selection of surgical indications and procedures associated with appropriate perioperative management are essential.

The increased use of laparoscopic approach in the treatment of CRC is attributed to several distinct advantages over open surgery. Indeed, many randomized controlled studies have reported that laparoscopic colorectal surgery requires a smaller incision and allows a decrease of postoperative pain and of postoperative ileus, a shorter length of stay, and an earlier recovery [3–7]. These advantages are particularly important in high-risk patients with older age, obesity, or patients with high American Society of Anesthesiologists (ASA) score [8–10], as they can help improve short-term outcomes and reduce morbidity and mortality.

To date, very few previous studies have evaluated the safety and invasiveness of laparoscopic right colectomy in series of elderly patients [11–13]. Many points including short-term outcomes

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of laparoscopic right colectomy remain unclear because large randomized controlled studies selected both young and elderly patients and mixed patients with resection of the right, left and sigmoid colon. Indeed, the present series was designed to clarify the safety of laparoscopic approach during right colectomy for cancer in elderly patients.

## 2. Materials and methods

### 2.1. Study design

All patients who underwent right colectomy for cancer were enrolled between 2004 and 2014 at Institut Mutualiste Montsouris. Of these, patients with recurrent colorectal cancer, those who required an emergency operation, or those who underwent surgery without resection were excluded. Data from our prospectively collected computer database were extracted, and further clinical information was extracted from reviews of medical charts. We decided to analyse retrospectively the outcomes of elderly patients selected in this study. Patients were divided into 4 groups: aged <64 years, between 65 and 74, between 75 and 84 and  $\geq 85$  years. This study was approved by the local institutional review board.

### 2.2. Surgical procedure

The laparoscopic approach was considered in all patients except in case of adjacent organs involvement or previous multiple open laparotomy, after the risks and benefits of the approaches had been explained adequately. The technique of laparoscopic right colectomy has been previously described [14] and was similar during the study period. Anastomosis was performed extracorporeally after the specimen had been retrieved through a small incision of about 5 cm, through a side-to-side or end-to-end hand-sewn simple layer suture. Conversion was defined as the need to perform conventional laparotomy to accomplish the procedure or a premature abdominal incision for dissection or vascular control. All procedures were performed by surgeons expert in laparoscopic colorectal surgery.

### 2.3. Postoperative outcomes and studied criteria

Postoperative complications were stratified according to the Dindo-Clavien classification [15] that defines major complications by a score of three or more. Both complications and operative mortality were considered as those occurring within 90 days of surgery, or at any time during the postoperative hospital stay. Surgical risk was assessed by means of the American Association of Anesthesiologists (ASA) and Charlson Comorbidities Index [16] according to clinical data from the day on which right colectomy was performed.

### 2.4. Statistical analysis

Qualitative variables were presented as effective (percentage) and compared between the two groups with a Chi-square test or a Fisher test. Quantitative variables were presented as means  $\pm$  standard deviations or as median (range). Differences between the different groups for quantitative variables were assessed with a Student t-test. Pre- and intra-operative variables that reached a univariate  $p$ -value  $< 0.1$  were entered into a logistic regression model, using a forward stepwise method. All statistical tests were two-sided and the threshold for statistical significance was set to  $p < 0.05$ . All statistical analyses were performed using SAS software version 9.2 (SAS Institute, Cary, NC).

## 3. Results

### 3.1. Preoperative characteristics

From 2004 to 2014, 545 patients underwent a right colectomy for cancer including 507 treated by a laparoscopic approach. There were 263 (50.1%) males and 244 (49.9%) females with a median age of 69 years, ranging from 17 to 94. One hundred and seventy-one (33.7%) patients younger than 64 years old belong to the Group A. Group B included 168 (33.3%) patients between 65 and 74 years old, Group C included 131 (25.7%) patients between 75 and 84 years old and Group D included 38 (9.3%) patients older than 85. The demographics characteristics of the four groups are detailed in Table 1. Group C and Group D patients had higher ASA score than Group A or Group B patients ( $p < 0.0001$ ) and were more likely to have hypertension, dyslipidemia or ischemic heart disease. However, the Charlson comorbidities index was comparable in the four groups ( $p = 0.57$ ). Groups C and D presented more frequently with anaemia (20.6% and 29.7%) compared to Group A and B (7.6% and 11.9%, respectively) ( $p = 0.001$ ). No patient had preoperative transfusion. Tumor location was comparable in the four groups and baseline CEA mean value was higher in Group A, however this difference did not reach a statistical significance.

### 3.2. Surgical procedures

As shown in Table 1, ileocolic anastomosis was hand sewn in 429 (84.4%) patients and 61 patients underwent resection of adjacent organs or associated procedures (abdominal wall  $n = 5$ , liver  $n = 13$ , small bowel  $n = 4$ , duodenum  $n = 4$ , ovary  $n = 8$ , gallbladder  $n = 6$ , omentum  $n = 4$ , kidney  $n = 1$ , and bladder  $n = 1$ ). Seven (1.3%) patients required a conversion to open surgery due to dense adhesions ( $n = 6$ ) and unclear anatomy with suspicion of ureter injury ( $n = 1$ ). There was no difference among the groups in terms of operative time, blood loss, or ureteral injury. However, intraoperative transfusion was more often required in Group C patients (8.3%,  $p = 0.006$ ).

### 3.3. Postoperative outcomes

Overall mortality was 0.05% including three patients who died from postoperative bleeding ( $n = 1$ ), pulmonary embolism ( $n = 1$ ) and septic shock after anastomotic leakage ( $n = 1$ ). No patient died in the Group D. Overall morbidity was 27.5% without any statistical difference in the four groups (24.5%, 29.1%, 7.5% and 18.4% respectively,  $p = 0.58$ ). However, Group D patients developed more frequently minor complications such as wound abscess, or postoperative ileus requiring nasogastric tube. These patients were also particularly affected by anastomotic leakage (10.5%) but the difference was not significant among the four groups ( $p = 0.13$ ). The four patients with anastomotic leakage in the Group D underwent reoperation with creation of a stoma (Table 2). The median length of stay of the whole population was 7 days, ranging from 3 to 179. As mentioned in Table 3, intraoperative blood transfusion was the only independent variable correlated with postoperative morbidity (OR 2.82; CI 95% 1.05–4.59,  $p < 0.0001$ ) and patient's age did not influence postoperative morbidity.

### 3.4. Pathological analysis and follow up

Regarding the final histopathology, 42% of Group D patients presented with TNM tumor stage III or stage IV disease while Group C patients had more TNM tumor stage II ( $p < 0.001$ ). Hundred fifty-five (30.5%) patients received adjuvant chemotherapy without any difference in the 4 groups (Table 4). Among the whole population, two patients died within 6 months after operation. After a

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