



# Are colorectal cancer patients at risk for COVID-19 infection during the postoperative period? The Covid-GRECCAR study

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## Abstract

**Introduction** During the COVID-19 pandemic, cancer patients have been regarded as having a high risk of severe events if they are infected with SARS-CoV-2, particularly those under medical or surgical treatment. The aim of this study was to assess the posttreatment risk of infection by SARS-CoV-2 in a population of patients operated on for colorectal cancer 3 months before the COVID-19 outbreak and who after hospitalization returned to an environment where the virus was circulating.

**Materials and methods** This French, multicenter cohort study included consecutive patients undergoing elective surgery for colorectal cancer between January 1 and March 31, 2020, at 19 GRECCAR hospitals. The outcome was the rate of COVID-19 infection in this group of patients who were followed until June 15, 2020.

**Results** This study included 448 patients, 262 male (58.5%) and 186 female (41.5%), who underwent surgery for colon cancer ( $n = 290$ , 64.7%), rectal cancer ( $n = 155$ , 34.6%), or anal cancer ( $n = 3$ , 0.7%). The median age was 68 years (19–95). Comorbidities were present in nearly half of the patients, 52% were at least overweight, and the median BMI was 25 (12–42). At the end of the study, 448 were alive. Six patients (1.3%) developed COVID-19 infection; among them, 3 were hospitalized in the conventional ward, and none of them died.

**Conclusion** The results are reassuring, with only a 1.3% infection rate and no deaths related to COVID-19. We believe that we can operate on colorectal cancer patients without additional mortality from COVID-19, applying all measures aimed at reducing the risk of infection.

**Keywords** Pandemic · COVID-19 outbreak · Cancer · Colorectal surgery · Oncology

## Introduction

With the COVID-19 pandemic, the management of patients with cancer has been significantly impacted, from diagnosis to follow-up, leading to a proposal of treatment strategy adaptations [1–5]. Reports from China have demonstrated that cancer patients infected with SARS-CoV-2 have at 3.5 times the

risk of requiring mechanical ventilation or intensive care (ICU) admission compared to the general population [6]. Cancer patients who received therapy in the 14 days preceding COVID-19 diagnosis had a fourfold higher likelihood of experiencing severe events [7]. Evidence suggests that patients who received surgery and concomitantly contracted COVID-19 were at much higher risk of severe clinical events than those who did not have surgery [6]. We can legitimately question whether patients operated on for colorectal cancer just before the start of the pandemic should be considered a high-risk group for experiencing critical impact due to the virus (ICU hospitalization or death). However, optimal treatments should be offered as soon as possible to cancer patients

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in the most secure environment possible, as the virus will still be circulating for an undetermined period of time [6]. Resumption of surgical activity is performed gradually, and the impact of SARS-CoV-2 during the postoperative period needs to be established to enable surgeons and patients to make evidence-based decisions. The aim of this study was to assess the posttreatment risk of infection by SARS-CoV-2 in a population of patients operated on for colorectal cancer 3 months before the COVID-19 outbreak in France who were followed during the worst period of the French outbreak. This information is not yet available, but we will need to operate, probably for several months, on cancer patients, who will then need to return to an environment where the virus is circulating.

## Materials and methods

### Design

This French-Belgian multicenter, observational, retrospective cohort study included 461 patients who underwent elective colorectal surgery for cancer between January 1 and March 31, 2020, at 20 hospitals. Data release and ethical considerations were discussed with an independent data monitoring and Ethics Committee. This observational study collected only routine, anonymized data, with no change to clinical care pathways. All patients agreed to the retrospective recording of data through the Covid-GRECCAR database. This study was approved by the Rouen University Hospital Institutional Ethics Committee. Each participating hospital included all patients undergoing elective surgery for colorectal cancer during the study period.

### Data collection

Demographic, clinical, treatment, and outcome data were extracted from electronic medical records by the site investigators of each hospital using a standardized anonymized data collection form. The 7th Edition of the AJCC was used. Obesity was defined by body mass index (BMI), and patients were categorized as follows: normal weight, BMI 18.5–24.9; overweight, BMI 25.0–29.9; obesity, BMI 30.0–39.9; and morbid obesity, a BMI above 40.

At the end of the study, which had been arbitrarily set for June 15, 2020, the patients were contacted by telephone to determine whether they had been infected with COVID-19. Patients were interviewed to determine whether they had been infected or hospitalized for COVID-19 infection. Clinical diagnosis consistent with SARS-CoV-2 infection was also assessed based on clinical symptoms highly suspicious for SARS-CoV-2 infection, including cough, fever, myalgia

and/or anosmia. When there was a strong suspicion of infection, the general practitioner or the hospital where the patient had been hospitalized were contacted to obtain confirmation of the diagnosis. Laboratory testing for SARS-CoV-2 infection was based on viral RNA detection by qRT-PCR, and radiological diagnosis was based on computed tomography (CT) of the chest.

Data were monitored by JJT, and missing, inconsistent, or implausible data were queried; all noncancer patients were removed from the database.

Descriptive statistics were used, and continuous and categorical variables are presented as medians and *n* (%), respectively.

## Results

A total of 461 adult patients underwent surgery for colorectal carcinoma in 20 hospitals during a 3-month period between January 1 and March 31, 2020. Thirteen patients died during the postoperative course (2.8%), and 448 surviving patients were the subject of this study. The median age was 68 years, ranging from 19 to 95 years. Comorbidities were present in nearly half of patients, with hypertension being the most common, followed by diabetes and coronary heart disease (Table 1). Fifty-two percent of the cases were at least overweight, and the median BMI was 25 (12–42). At the end of the study, on June 15, 2020, 448 patients were alive. Six patients (1.3%) had developed a COVID-19 infection; among them, 3 were hospitalized in the conventional ward, and none of them died. The six patients developed a COVID-19 infection with a median time of 30 days from the date of surgery (20–45), and all of them had already been discharged from the surgical department.

## Discussion

France is the 9th country most affected, with 449 deaths per million inhabitants. The number of deaths per day increased from March 9 (6 deaths) and reached a peak on April 2 (1355 deaths); the number of deaths was above 1000/day until April 15 and then slowly decreased. France declared a partial lockdown from March 11 to May 11.

The cancer patients included in this study were all operated on between January 1 and March 31, 2020, a period with only a few cases of COVID-19. Patients were followed until June 15, which was the peak of COVID-19 in France. The effect of partial lockdown could not be clearly evaluated, but the rate of COVID-19 infection in this colorectal cancer cohort was only 1.3% (6/448), with no death related to the infection. This contamination rate may have been minimized in the

**Table 1** Demographic and cancer characteristics and treatment for the study population

Sex, <i>n</i> (%)		Histology, <i>n</i> (%)	12
Female	186 (41.5)	Adenocarcinoma	433 (96.6)
Male	262 (58.5)	Epidermoid carcinoma	3 (0.7)
		Neuroendocrine tumor	11 (2.5)
Age, years <i>n</i> (%)		Melanoma	1 (0.2)
<50	43 (9.6)		
50–69	209 (46.7)	Cancer location, <i>n</i> (%)	
70–79	122 (27.2)	Colon	290 (64.7)
≥80	74 (16.5)	Rectum	155 (34.6)
		Anus	3 (0.7)
Comorbidities, <i>n</i> (%)			
Hypertension	188 (41.9)	Synchronous metastasis, <i>n</i> (%)	49 (10.9)
Diabetes mellitus	130 (29)		
Chronic obstructive pulmonary disease	35 (7.8)	Preoperative chemoradiation, <i>n</i> (%)*	80 (51.6%)
Asthma	9 (2)		
Coronary heart disease	39 (8.7)	Surgical approach, <i>n</i> (%)	
Chronic kidney disease	23 (5.1)	Laparoscopy	317 (70.7)
		Converted laparoscopy	107 (23.9)
Immunosuppressive treatment, <i>n</i> (%)	9 (2)	Laparotomy	24 (5.4)
Corticosteroid treatment, <i>n</i> (%)	8 (1.8)	Cancer stage, <i>n</i> (%)	
		Stage 0	30 (6.7)
ASA grade, <i>n</i> (%)		Stage I	99 (22)
1–2	328 (73.2)	Stage IIA	109 (24.3)
3–4	120 (26.8)	Stage IIB-IIC	17 (3.8)
		Stage IIIA	20 (4.5)
Blood type, <i>n</i> (%)		Stage IIIB	92 (20.6)
A	160 (41.2)	Stage IIIC	30 (6.7)
B	30 (7.7)	Stage IVA	43 (9.6)
AB	7 (1.8)	Stage IVB	3 (0.7)
O	191 (49.3)	Stage IVC	5 (1.1)
Missing	60		
		Adjuvant chemotherapy, <i>n</i> (%)	165 (36.8)
Under weight, <i>n</i> (%)	9 (2)		
Normal weight, <i>n</i> (%)	205 (45.8)		
Overweight, <i>n</i> (%)	160 (35.7)		
Obese, <i>n</i> (%)	71 (15.8)		
Morbid obese, <i>n</i> (%)	3 (0.7)		

\*Preoperative chemoradiation was only considered for the rectal cancer group

study because we only took into account symptomatic infections. We did not perform serological screening or PCR on the entire cohort and therefore missed asymptomatic patients; however, this does not seem to be clinically relevant for our study.

With the COVID-19 epidemic, dramatic health system reorganization has been necessary. These reorganizations were mandatory because we did not have enough beds, equipment or staff to care for a surge of patients in a widespread, fast-escalating outbreak. In this context, the management of patients with cancer has been significantly impacted. Several

recommendations [1–5] have been published on oncologic management during the pandemic; however, it is unclear when these recommendations should be applied. Several publications with a very small number of patients reported that having cancer and receiving cancer therapies could be a plausible risk factor for both contracting SARS-CoV-2 infections and having more severe COVID-19 outcomes [7, 8]. Surgery is another vital component in cancer management. Evidence suggests that patients who received surgery and concomitantly contracted COVID-19 were at a much higher risk of severe clinical events than were those who did not have surgery [9,

10, 11]. Lei et al. [9] reported 34 patients in whom the infection was assessed after surgery. In this group of patients, 15 (44.1%) needed ICU care, and 7 (20.5%) died. These patients underwent surgery in the worst situation possible, in an extremely active cluster at the beginning of the epidemic and without any preventive measures. When we examine at the entire cohort of patients who underwent an operation [12], the situation seems to be less worrying, with an infection rate of 0.22%, a mortality rate related to COVID-19 infection of 0.046%, and 0.1% of patients needing ICU care.

Surgical and oncological activities will gradually return to normal, and optimal treatments should be offered to patients as soon as possible and in the most secure environment possible.

Adaptations of our health system and of our ways of treating patients will have to be made to minimize the risk of infection, and these adaptation measures have been developed in other publications [6, 13].

We emphasize here the need to inform and educate cancer patients, and these educative measures may have played a role in reducing the infection rate reported in this study. Cancer patients should be informed that they are more at risk of developing a severe infection. Information on hand washing, social distancing measures, symptoms and signs of infection, the risks of multiple travel events, and the need to inform healthcare personnel of any new symptom that may give rise to fear of infection must be delivered.

This study had limitations in that it is a retrospective study that only took into account infections with clinical symptoms of COVID-19.

This is the first study examining the risk of COVID-19 infection during the postoperative period of colorectal cancer surgery. The results are reassuring, with only a 1.3% infection rate and no deaths related to COVID-19. We believe that we can operate on colorectal cancer patients without additional mortality from COVID-19, applying all measures aimed at reducing the risk of infection.

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## References

- Bartlett DL, Howe JR, Chang G et al (2020) Management of cancer surgery cases during the COVID-19 pandemic: considerations. *Ann Surg Oncol* 27:1717–1720
- Bitar N, Kattan J, Kourie HR, Mukherji D, Saghir NE (2020) The Lebanese Society of Medical Oncology (LSMO) statement on the care of patients with cancer during the COVID-19 pandemic. *Future Oncol* 16:615–617
- Tuech JJ, Gangloff A, Di Fiore F et al (2020) Strategy for the practice of digestive and oncological surgery during the Covid-19 epidemic. *J Visc Surg* 157:S7–S12
- Di Fiore F, Bouché O, Lepage C et al (2020) COVID-19 epidemic : proposed alternatives in the management of digestive cancers : a French intergroup clinical point of view (SNFGE, FFCD, GERCOR, UNICANCER, SFCO, SFED, SFRO, SFR). *Dig Liver Dis* 52:597–603
- Glehen O, Kepenekian V, Bouché O, Gladieff L, Honore C, Abba J, Abboud K, Arvieux C, Bakrin N, Delhorme JB, Dartigues P, Durand-Fontanier S, Eveno C, Fontaine J, Gelli M, Goere D, Guyon F, Lefevre J, Lo Dico R, Marchal F, Nadeau C, Paquette B, Pezet D, Pocard M, Rousset P, Sgarbura O, Taibi A, Tuech JJ, You B, Villeneuve L (2020) Treatment of primary and metastatic peritoneal tumors in the Covid-19 pandemic. Proposals for prioritization from the RENAPE and BIG-RENAPE groups. *J Visc Surg* 157:S25–S31
- Liang W, Guan W, Chen R, Wang W, Li J, Xu K, Li C, Ai Q, Lu W, Liang H, Li S, He J (2020) Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. *Lancet Oncol* 21:335–337
- Zhang L, Zhu F, Xie L, Wang C, Wang J, Chen R, Jia P, Guan HQ, Peng L, Chen Y, Peng P, Zhang P, Chu Q, Shen Q, Wang Y, Xu SY, Zhao JP, Zhou M (2020) Clinical characteristics of COVID-19-infected cancer patients: a retrospective case study in three hospitals within Wuhan, China. *Ann Oncol* 31:894–901
- Tuech JJ, Gangloff A, Di Fiore F, Benyoucef A, Michel P, Schwarz L (2020) The day after tomorrow: how should we address health system organization to treat Cancer patients after the peak of the COVID-19 epidemic? *Oncology* 98:1–9. <https://doi.org/10.1159/000509650>
- Lei S, Jiang F, Su W et al (2020) Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. Version 2. *EClinicalMedicine* 21: 100331. <https://doi.org/10.1016/j.eclinm.2020.100331>
- COVIDSurg Collaborative (2020) Mortality and pulmonary complications in patients undergoing surgery with perioperative SARS-CoV-2 infection: an international cohort study. *Lancet*. 396:27–38
- Besnier E, Tuech JJ, Schwarz L. We asked the experts: Covid-19 outbreak: is there still a place for scheduled surgery? Reflection from pathophysiological data. *World J Surg* 2020;44:1695–1698
- Tuech JJ, Schwarz L (2020) Can we operate our patients without fear during the period of COVID-19 infection? Version 2. *EClinicalMedicine*. 23:100382. <https://doi.org/10.1016/j.eclinm.2020.100382>
- Yao H, Pang K, Xiao G, Li F, Xiao Y, Ye Y, Wang X, Xiu D, Wang Z, du X, Yao Y, Zhou L, Zhou C, Gu J, Zhang Z (2020) What should surgeons do in the face of the coronavirus disease 2019 pandemic? A Beijing Experience. *Dis Colon Rectum* 63: 1020–1022

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