

Evaluating the feasibility of performing elective gastrointestinal cancer surgery during the COVID-19 pandemic: An observational study with 60 days follow-up results of a tertiary referral pandemic hospital

Alper Sozutek MD, PhD  | Ahmet Seker MD, PhD | Adnan Kuvvetli MD | Nazmi Ozer MD | Ismail Caner Genc MD

Division of Gastroenterological Surgery,
Department of General Surgery, Adana City
Training and Research Hospital, Health
Sciences University, Adana, Turkey

Correspondence

Alper Sozutek, MD, PhD, Division of
Gastroenterological Surgery, Department of
General Surgery, Adana City Training and
Research Hospital, Health Sciences
University, Adana, Turkey.
Email: dralpers@gmail.com

Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic has interfered with the treatment algorithm for patients with gastrointestinal (GIS) cancer, resulting in deferral of surgery. We presented the outcomes of our patients to evaluate whether surgery could be safely performed and followed-up without delaying any stage of GIS cancer during the pandemic.

Methods: This was an observational study of 177 consecutive patients who underwent elective GIS cancer surgery between March 11 and November 1, 2020. They were assessed regarding their perioperative and 60 days follow-up results for either surgical or COVID-19 status. Morbidity was determined according to the Clavien-Dindo classification (CDC). Continuous and categorical data were presented as median \pm SD and number with percentage (%), respectively.

Results: The study included 44 gastric, 33 pancreatic, 40 colon, and 59 rectal cancer patients. All patients underwent surgery and received neo/adjuvant treatments without delay. The overall morbidity (CDC grade II–IV) and mortality rates were 10.1% and 3.9%, respectively. None of the patients or medical staff were infected with COVID-19 during the study period.

Conclusion: GIS cancer surgery can be safely performed even within a pandemic hospital if proper isolation measures can be achieved for both patients and health workers. Regardless of the tumor stage, surgery should not be deferred, depending on unstandardized algorithms.

KEYWORDS

COVID-19, delay, gastrointestinal cancers, oncologic surgery, surgical outcomes

1 | INTRODUCTION

The emergence of the first case of coronavirus disease 2019 (COVID-19) in Turkey on March 11, 2020, has dramatically changed our healthcare system to accommodate the ongoing pandemic

condition, as in the whole world. In parallel with the evolving condition, our institution was designated as one of the first pandemic hospitals in Turkey. In response to the initial needs, a vast majority of health care workers, hospital resources, inpatients' services, intensive care units (ICUs), and beds were primarily allocated for the

treatment of patients with COVID-19. These unprecedented demands on hospital resources mainly affected all surgical disciplines, eventually leading to the suspension of elective surgeries for an indefinite period. Moreover, in line with increasing recommendations from prominent surgical associations about triage and the management of cancer patients to mitigate the exposure to COVID-19, the treatment programs were rescheduled, resulting in a paradigm shift in the treatment of patients with precancerous lesions, early-stage or uncomplicated cancers.¹⁻⁶ However, concerning that short-term surgical delays may result in unpredictable negative outcomes even in the early stages of cancer, irrespective of their surgical branch, every specialist focused on finding a way to ensure their accustomed oncological practice while dealing with an enemy that was never faced before.^{7,8}

Due to our specialty, we focused on gastrointestinal system (GIS) cancer surgery during the pandemic. It deserves attention because of several concerns: (1) GIS cancers are frequently detected in patients aged 50 or older which is accepted as the highest risk group that may develop severe symptoms related to COVID-19 infection. (2) Age-related comorbidities are the main factors that worsen the prognosis for both. (3) Although the mortality rate of GIS cancer is not solely specified, cancer has been regarded as a negative factor on the prognosis of COVID-19 infection with a mortality rate of 5.6%. (4) Prolonged hospital stays of patients undergoing GIS cancer surgery may amplify the risk of contamination with COVID-19.⁹⁻¹¹ On the other hand, regardless of these concerns, early detection and radical resection of the tumor is the key point to achieve a successful oncologic outcome in the treatment of GIS cancer patients.^{12,13} It is well-known that delaying may cause a deleterious impact on the prognosis and survival of these patients.¹⁴⁻¹⁶

According to the national health data of Turkey on December 31, 2020, we have a total of 2,208,652 infected patients with a total of 20,881 deaths since the beginning of the pandemic. We are still struggling with the COVID-19 outbreak since the first case. As observed during the pandemic, our concerns were justified, and no definitive treatment has been found so far, except for various vaccines whose long-term protective potential is not completely clinically proven. Likewise, the issue of "how to provide sufficient doses for the whole population?" is not well explained. Recently, the mutation of the virus has been another subject of debate.¹⁷ This implies that the current situation will continue to prevail for a while, thus necessitating a prompt adaptation of the health care system to the existing conditions, which is essential for maintaining the treatment of patients with GIS cancer to prevent them from the negative impacts related to delay in surgery.

Considering the current literature, there are limited data regarding the surgical outcomes of patients undergoing elective GIS cancer surgery during pandemics. Therefore, we believe that contributing to the existing literature is essential to further elucidate the feasibility of surgery during this rapidly evolving condition, for both patients and clinicians. Considering the number, as well as the follow-up period of the patients included, this study may serve as a good reference to reflect the surgical aspect of pandemics. In the present

study, we aimed to present the perioperative surgical approach and 60 days follow-up outcomes of patients who underwent elective gastric, pancreatic, and colorectal cancer surgeries since the beginning of the COVID-19 outbreak. The aim of this study was to provide a reference to all multidisciplinary oncologic teams whether surgery can be safely performed and followed-up without deferring any type or stage of GIS cancer during pandemics.

2 | PATIENTS AND METHODS

This was an observational, cohort, unicentric study conducted in Adana City Training and Research Hospital, Department of Gastroenterological Surgery, between March 11, 2020, and November 1, 2020. The medical data of all consecutive patients who underwent elective surgery for esophagogastric junction (EGJ), gastric, pancreatic, and colorectal cancer were recorded. Patients undergoing emergency surgery for cancer-related GIS complications, such as obstruction, bleeding, and perforation, and patients with unresectable metastatic disease were excluded. This study was conducted in accordance with the 1983 Helsinki Declaration. Written informed consent was obtained from all patients concerning the risks associated with the relevant surgeries, as well as COVID-19 infection. This study was approved by the Turkish Ministry of Health Science Committee and the hospital's ethical committee for clinical studies (1138/2020).

The parameters included the patient's demographic factors, comorbidities, American Society of Anesthesiologists (ASA) score, preoperative laboratory parameters and imaging studies, type of cancer, neoadjuvant treatment, type of operation, operation time, Clavien-Dindo classification (CDC) score,¹⁸ tumor stage according to the final histopathologic examination of the specimen, length of hospital stay, mortality, and 60 days follow-up outcomes were recorded. The operation time was defined as the time from the first skin incision to the last suture in skin closure. Length of hospital stay was defined as the period between hospitalization and discharge. The results of preoperative nasal and pharyngeal swab tests were also noted. Irrespective of the symptoms, postoperative swabs were taken one day before the estimated date of discharge. The swab tests were also performed on patients who died after postoperative day (POD) 5 in the hospital to verify their association with COVID-19.

3 | PERIOPERATIVE APPROACH AND FOLLOW-UP PROCEDURES OF THE PATIENTS

Preoperative patient preparation was performed at our outpatient clinic. After determining the current stage of the disease, all patients were adequately informed about the treatment strategy, as well as the development of possible complications and upstaging of their disease, in case of delay. Subsequently, the patients and their

companions, particularly patients older than 50 years and those with comorbidities, were broadly informed of the risks conferred by COVID-19. The possible ways of transmission and protection, treatment, and prognosis of COVID-19 were explained in detail. The patients and their companions were educated in detail regarding the importance of wearing masks, social distancing, and hygiene. Surgery was planned after the patients' and the researchers' concerns were completely resolved. The treatment strategy was determined based on the National Comprehensive Cancer Network (NCCN) guidelines for EGJ, gastric, pancreatic, and colorectal cancers.^{19–21} Tumor nodes metastases (TNM) classification was used to determine the stage of cancer. Before surgery, all patients were evaluated individually by a multidisciplinary team, including two medical oncologists, two radiation oncologists, and two pathologists.

All patients underwent a prehabilitation program at home for 7 days before surgery, which included breathing exercises, mobilization, regulation of anticoagulation therapy, quitting smoking, and hazardous drinks. According to the European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines²² for cancer patients, regardless of their nutritional status, patients with gastric or pancreatic cancer received oral immunonutrition (arginine, omega-3 fatty acids, nucleotides/twice a day) for 5 days until the date of operation.

All patients were hospitalized 2 days before surgery to accommodate both, the patients and their companions to hospital's precautions, as well as to facilitate the preoperative preparation of the patients. All patients were tested for COVID-19 using real-time polymerase chain reaction assay by nasal and pharyngeal swabbing 24 h before surgery. Thorax computed tomography of all patients was also evaluated 3 days before surgery, for any latent signs of COVID-19 and to rule out distant metastasis and other lung diseases.

The surgical team consisted of two specialist surgeons, two senior surgeons, six resident surgeons, four senior anesthetists, six nurses, and two auxiliary staff. Two operating rooms were reserved for oncologic surgery. A maximum of three patients was planned for each day, except for weekends. The operation room was sterilized immediately before starting the operation, for 30 min. The surgical staff was questioned before the operation if they manifested COVID-19 symptoms, including fever, fatigue, dyspnea, coughing, and myalgia. In case of any doubt, the staff was discharged from the operation. Depending on the type of surgery, we tried to limit the number of attendant staff as much as possible. The operating room was kept under negative pressure and remained locked during surgery to prevent uncontrolled entries into the room. Personal protection equipment was used if COVID-19 was suspected. All operations were performed as conventional open procedures to avoid high aerosol inhalation related to laparoscopy and to diminish the operation time.

After completing the operation, all patients were followed-up in the ICU in a single room. The patient was transferred to the clinic if his/her vital signs were stable after POD 1. Individual Enhanced Recovery After Surgery (ERAS) postoperative protocol²³ was performed for all patients to facilitate the discharge period of the

patient. The patient and his/her companion were not allowed to go outside the clinic during their hospital stay. Postoperative visits to patients were performed with a maximum of three staff members wearing an N-95 mask and a surgical box gown. Hand disinfectants were used each time upon entering and exiting the patient's room.²⁴

After discharge, all patients were followed-up every 15 days for COVID-19 symptoms until POD 60, either by a phone call or at our outpatient clinic. The preventive measures for COVID-19 and their importance were reminded to the patient at every meeting for consistent clinical awareness.

4 | STATISTICAL ANALYSIS

The data obtained were summarized in a computerized spreadsheet, and statistical analyses were performed using IBM SPSS Statistics 25. Numerical data are presented as median \pm standard deviation (SD), and categorical data are expressed as number and percentage (%).

5 | RESULTS

A total of 177 consecutive patients undergoing elective GIS cancer surgery were enrolled in this study, which included 44 patients with EGJ/gastric cancer, 33 with pancreatic cancer, 40 with colon cancer, and 59 with rectal cancer. The distribution of sex was 20 females (F)/24 males (M), 17F/17M, 23F/17M, and 18F/41M, with a median age of 59.6 ± 13.2 , 64.3 ± 10.2 , 65.5 ± 12.1 , and 63 ± 11.1 years, for EGJ/gastric, pancreatic, colon, and rectum cancer, respectively. The total mean ASA scores of the patients were ASA 3 (53.1%) and ASA 4 (7.9%).

Neoadjuvant chemotherapy (NACT) was administered to 28 patients diagnosed with T2 or higher/N adenocarcinoma or signet-ring cell EGJ or gastric cancer during this period. Five patients had already completed their NACT before the pandemic. Four patients underwent Ivor-Lewis esophagectomy, 22 patients underwent total gastrectomy (TG) + D2 lymph node dissection (TG + D2), and 11 patients underwent subtotal gastrectomy (SG) + D2, one month after completing NACT. Four patients (9.1%) with T1 gastric cancer underwent surgery directly because they refused endoscopic resection. Four patients (9.1%) with Grade 1 neuroendocrine tumor (NET) underwent TG, and three patients (6.9%) with a cardiac-localized gastrointestinal stromal tumor (GIST) underwent wedge resection. The postoperative course of 36 (81.8%) patients was uneventful. According to the CDC, two patients (4.5%) were classified as Grade 1 because of delayed postoperative oral tolerance, and Grade 2 complications were observed in four patients (9%) with surgical-site infection requiring antibiotherapy. Cerebral embolism occurred in one patient (2.2%) on POD 6; however, he was treated and discharged on POD 37. Two patients (4.5%) with severe comorbidities died of cardiopulmonary arrest on POD 2 and 12, respectively. Although the vast majority of final histopathologic examination of the specimens was accepted, four pathologic reports

were remarkable. One patient with Grade 1 NET was finally diagnosed with Grade 2 NET. Lymph node (LN) metastasis was detected in one patient who was preoperatively diagnosed with NET 1 and 2 patients with T1 gastric cancer. The median length of hospital stay of the patients undergoing gastric surgery was 10.8 ± 6.1 (5–37) days.

In the pancreatic cancer group, two patients (6.1%) with borderline/locally advanced pancreatic cancer received NACT. All patients underwent a successful pancreaticoduodenectomy. Twenty-seven patients (78.8%) underwent surgery for ductal adenocarcinoma, five patients (15.1%) for intraductal papillary mucinous neoplasm (IPMN), and two patients (6.1%) for NET. Eighteen patients (52.9%) had an uneventful recovery period, while three patients had delayed oral tolerance and bowel movements. Minor pancreatic fistula was observed in eight patients (23.5%) and was conservatively treated, while one patient (2.9%) required percutaneous drainage. Cerebral embolism occurred in one patient (2.9%) on POD 12; however, it was conservatively treated and discharged on POD 33. Three patients (8.8%) died of sepsis on POD 3, 7, and 14, respectively. The remarkable histopathologic finding in this group was that LN metastasis was detected in one patient with IPMN and one patient with NET, despite the small size of the tumor. The median length of hospital stays of the patients undergoing pancreatic surgery was 15.3 ± 7.8 (3–38) days.

All patients in the colon cancer group underwent surgery within 2 weeks of the initial diagnosis. In particular, three patients with familial adenomatous polyposis (FAP) (three with tubulovillous adenoma) and one patient with ulcerative colitis (UC) (multiple pseudopolyps, high-grade dysplasia) drew attention. Furthermore, COVID-19 was diagnosed in two patients immediately before surgery. They received inpatient treatment even though they were asymptomatic to avoid overlooking possible complications. Surgery was performed three days post completion of treatment. No postoperative complications were observed in 30 patients (75%). Delayed bowel movement was observed in five patients (12.5%). Two patients (5%) received blood transfusion, and four patients (10%) with surgical-site infection required antibiotic therapy. Two patients (5%) underwent reoperation due to anastomosis leakage. One patient (2.5%) died of cardiopulmonary arrest on POD 1. Histopathologically, T1 tumors were detected in two patients with FAP, and T2 tumors with metastatic LN were detected in one patient with UC. The median length of hospital stays of the patients undergoing colon surgery was 13.1 ± 20.1 (1–130) days.

The patients with mid- or low-localized rectal cancer staged T3 or higher/N received NACT and radiotherapy. Surgery was performed between 6 and 8 weeks after completing the neoadjuvant treatment. A complete response was observed in four patients. However, LN metastasis was detected in the specimens of two patients. Furthermore, Grade 2 NET with LN metastasis was detected in one patient who was preoperatively diagnosed with Grade 1 NET. Fifty patients (84.7%) had an uneventful recovery period, while two patients suffered from a delayed bowel movement, and six patients received antibiotic therapy for mild wound infection. One patient (1.6%) died of cardiopulmonary arrest on POD 5. The median length

of hospital stay of the patients undergoing rectal surgery was 9.1 ± 3.3 (5–22) days.

None of the included patients acquired COVID-19 infection, either during their hospital stays or within 60 days after surgery. Similarly, neo/adjuvant treatment was uneventful. Furthermore, none of the medical staff enrolled in this study were infected by COVID-19 during the study period.

The results are elaborated in Table 1.

6 | DISCUSSION

Although knowledge regarding the prognosis and treatment of COVID-19 is currently trivial, leading cancer-specific associations have abruptly presented low-evidence-based recommendations regarding the treatment of GIS cancers from the very early beginning of the pandemic.^{1,4} The patients were prioritized according to the biological behavior and stage of their disease that triggered some debates among our colleagues about the treatment algorithm of GIS cancers.^{1,4} Accepting their concerns about the treatment of particularly low-risk cancer patients during the COVID 19 pandemic, the negative impacts of delaying surgery on surgical outcomes were considered, because the response to the questions “How long can we defer surgery in low-risk GIS cancer patients?”, “Do we know when will COVID-19 outbreak end?”, “Do we underestimate the tumor biology?”, “Do we trust the imaging studies at initial diagnosis? What if we stay under stage at initial diagnosis or encounter upstaged tumor according to the final pathology report?” was unclear.

Despite the patients having justified concerns about the negative impacts associated with deferring their treatments, a considerable number of either newly or already diagnosed GIS cancer patients displayed irrational behaviors such as canceling their hospital admissions without taking any expert opinion during the pandemic. This was absolutely due to their fear of being infected with COVID-19 during hospitalization as well as multiple hospital admissions during adjuvant treatment. This dilemma arose because they were inadequately informed about the process. They believed that “all operations were canceled, and all clinicians struggled with COVID-19 patients” Although not included in this study, unfortunately, we encountered a considerable number of patients with complicated or upstaged GIS tumors during the study period owing to this thought.

In fact, taking into account the clinical progress of the patients infected with COVID-19, the biologic behavior of COVID-19 was unstable. There was individual variability in terms of clinical symptoms and progress, and even death could be encountered in a patient without any comorbidities. Moreover, the risk of contamination was similar for everyone and everywhere. In contrast, the fact that deferring the surgical procedure results in a poor prognosis of GIS cancer is well known and is highly evidence-based.^{12,13} It is also notable that once the treatment is deferred, the follow-up of the patient falls apart because of the high patient burden of the clinicians. Likewise, another point that needs to be highlighted is the

TABLE 1 The outcomes of the patients according to their cancers

Parameters of patients (n = 177)	EGJ/gastric cancer (n = 44)	Pancreatic cancer (n = 34)	Colon cancer (n = 40)	Rectum cancer (n = 59)
Age (years)	59.6 ± 13.2	64.3 ± 10.2	65.5 ± 12.1	63 ± 11.1
Sex (female/male)	20/24	17/17	23/17	18/41
ASA score				
ASA 1	0	0	3 (7.5%)	2 (3.3%)
ASA 2	15 (34.1%)	11 (32.3%)	15 (37.5%)	13 (22%)
ASA 3	25 (56.8%)	20 (58.9%)	18 (45%)	31 (52.5%)
ASA 4	4 (9.1%)	3 (8.8%)	4 (10%)	3 (5.2%)
Screening for COVID19				
(Preoperative/Postoperative)				
Swab test	44 (-/-)	34 (-/-)	40 (+2/-)	59 (-/-)
Thorax CT	44 (-/0)	34 (-/0)	40 (-/0)	59 (-/0)
Tumor localization	EGJ 4 (9%) Cardia 9 (20.5%) Corpus 12 (27.3%) Antrum 19 (43.2%)	Head 15 (44.2%) Distal 1 (2.9%) Periampullary 18 (52.9%)	Right 22 (55%) Left 3 (7.5%) Synchronous 15 (37.5%)	Upper 13 (22.1%) Mid 21 (35.6%) Low 25 (42.3%)
Preoperative diagnosis	AC 32 (72.7%) Signet cell AC 5 (11.3%) NET 4 (9.1%) GIST 3 (6.9%)	Ductal AC 27 (78.8%) IPMN 5 (15.1%) NET 2 (6.1%)	AC 36 (90%) FAP 3 (7.5%) UC 1 (2.5%)	AC 59 (100%)
Neoadjuvant treatment	33 (75%)	2 (6.1%)	0	46 (78%)
Surgery	Ivor-Lewis esophagectomy 4 (9.1%) TG+ D2 dissection 26 (59%) SG+ D2 dissection 11 (25%) Wedge resection 3 (6.9%)	PD (97.1%) DP (2.9%)	Right HC 22 (55%) Left HC 3 (7.5%) TC + IRA 11 (27.5%) TPC + IPA 4 (10%)	AR 13 (22%) LAR 37 (62.7%) APR 9 (15.3%)
Operative time(min)	210.6 ± 69.3 (60–480)	392.2 ± 72.2 (240–555)	150.3 ± 61.2 (60–390)	209.2 ± 68.7 (120–420)
Clavien-Dindo classification				
None	36 (81.8%)	18 (52.9%)	30 (75%)	50 (84.7%)
Grade 1	2 (4.5%)	3 (8.8%)	1 (2.5%)	2 (3.3%)
Grade 2	4 (9%)	8 (23.5%)	6 (15%)	6 (10.1%)
Grade 3	0	1 (2.9%)	2 (5%)	0
Grade 4	1 (2.2%)	1 (2.9%)	0	0
Grade 5	1 (2.2%)	3 (8.8%)	1 (2.5%)	1 (1.6%)

TABLE 1 (Continued)

Parameters of patients (n = 177)	EGJ/gastric cancer (n = 44)	Pancreatic cancer (n = 34)	Colon cancer (n = 40)	Rectum cancer (n = 59)
Final stage of cancer				
Stage I	6 (13.6%)	13 (38.2%)	10 (25%)	14 (23.7%)
Stage II	15 (34.1%)	14 (41.1%)	14 (35%)	16 (27.1%)
Stage III	16 (36.3%)	6 (17.6%)	15 (37.5%)	27 (45.7%)
Stage IV	0	0	1 (2.5%)	1 (1.6%)
GIST/NET	Grade 1 (3/2)– Grade 2 (0/2)	Grade 2 (1)	-	Grade 2 (1)
Length of hospital stay	10.8 ± 6.1 (5–37)	15.3 ± 7.8 (3–38)	13.1 ± 20.1 (1–130)	9.1 ± 3.3 (5–22)
Follow-up time (month)	4.5 ± 1.9 (2–9)	3.8 ± 2.3 (2–9)	4.5 ± 1.8 (2–9)	9.1 ± 3.3 (2–9)

Abbreviations: AC, adenocarcinoma; AP, Familial adenomatous polyposis; APR, abdominoperineal resection; AR, anterior resection; DP, distal pancreatectomy; EGJ, esophagogastric junction; GIST, gastrointestinal stromal tumor; HC, hemicolectomy; IPA, ileoanal pouch anastomosis; IRA, ileorectal anastomosis; LAR, low anterior resection; NET, neuroendocrine tumor; PD, ancreaticoduodenectomy; SG, subtotal gastrectomy; TC, total colectomy; TG, total gastrectomy; TPC, total proctocolectomy; UC, ulcerative colitis.

ethical dilemma. Development of highly morbid and mortal complications associated with deferring surgery may result in facing further serious medico-legal problems when the pandemic ends. Therefore, we investigated the current situation and never changed our surgical approach based on low evidence-based recommendations for precancerous lesions or any stage of GIS cancer, in order not to overlook the “windows of opportunity” since the beginning of the pandemic. We preferred improving the circumstances, as well as enhancing the clinical awareness of the pandemic among patients with GIS cancer and medical staff instead of deferring the treatment process. Subsequently, the precautions, resources, and configuration of our hospital were revised.²⁴

Our hospital is located in Adana, which is the fifth-largest province in Turkey. Although its population is 3 million, we serve approximately 10 million more people, since it is a referral center for its neighboring provinces and countries, including Iraq and Syria. Although the geographic localization seems to be a high-risk factor for amplifying the spread of the disease, we achieved successful surgical outcomes. This was likely due to well-applied strict precautions, as well as the design of our hospital. It can be acknowledged that the configuration and infrastructure of our hospital were the main factors for successful outcomes. The hospital is a health complex consisting of four separate blocks that are connected to each other with a middle block consisting of two floors that include 16 operating rooms on each floor. Three ICU's with 18 patients beds were located on the first two floors in every block. The other floors included three separate wings with 20 single patient rooms reserved for the relevant clinic. This configuration enabled us to maintain sufficient social distance from healthcare workers, patients, and their companions allocated to COVID blocks, thus mitigating the hospital-related transmission of COVID-19. Since the beginning of the COVID-19 outbreak, two blocks were reserved for the treatment of COVID-19 patients and the others were reserved for the treatment of non-COVID patients; thus, we were able to avoid contamination inside

the hospital. If COVID-19 was diagnosed just before the operation, the patient was transferred to COVID blocks in an isolated single room to maintain treatment for both COVID-19 infection and disease-related symptoms. If an urgent complication, such as obstruction, bleeding, perforation, etc. occurred, the operation was performed in the operating room located in the COVID block. If not, the operation was performed in the non-COVID block immediately after completing the treatment for COVID-19 of the patient when respiratory tests improved and the swab was negative. It is notable that while this paper is written, we were severely struggling with the second peak of the COVID-19 outbreak that began in the middle of September 2020 in Adana. Although our bed capacity reserved for cancer patients diminished by 20% compared to before, we successfully managed, are still managing, the risk of contamination, and carried out the GIS cancer surgery owing to the configuration of our hospital. Regardless of political view, we are very grateful to our government and hospital leaders for organizations that enable us to maintain the treatment process of patients with GIS cancer without delay.

Age and age-related comorbidities are the main risk factors that determine the clinical progress of COVID-19 infection. In a recent study by Yanez et al.,²⁵ including the results of 16 countries, COVID-19 mortality rates have been found to be strikingly high in persons aged over 65 years, and male sex was a risk factor for death. Cancer has also been regarded as a negative factor in the prognosis of COVID-19 infection, with a mortality rate of 5.6%.¹¹ Moreover, compared with other surgical interventions, patients undergoing GIS cancer surgery have a relatively longer hospital stay because of multiple follow-up variables such as oral tolerance, bowel movements, anastomosis leakage, bleeding, and wound infection, which may lead to high morbidity and mortality. The prolonged hospital stay is another risk factor that amplifies the risk of contamination of COVID-19. Considering these issues, the present study group can be regarded as highly susceptible to COVID-19 infection. Interestingly,

the authors bear witness to a considerable number of deaths in patients aged between 35 and 55 years without any comorbidities in recent days. Therefore, more comprehensive studies regarding the pathophysiology of COVID-19 infection are needed to elucidate the reason for mortality associated with COVID-19 infection.²⁶

Our overall mortality rate was 3.9%, and it was associated with either comorbidities or surgical-related complications, and no deaths were associated with COVID-19 infection during their hospital stay. Moreover, despite the limited number of patients, it was observed that surgery can be scheduled 5 days after completing the treatment of COVID-19, provided the swab test, as well as the respiratory functions of the patient, are normal immediately before the operation. The mean value of the overall length of hospital stay of the patients was between a range of 10 and 15 days. We utilized the ERAS guidelines for the postoperative course to diminish the time of hospital discharge. The ERAS guidelines are already followed in our clinical practice because we think that this approach improves metabolic and immune responses, thereby facilitating the postoperative recovery period of patients undergoing GIS surgery.²³ A vast majority of the patients (87%) displayed a good tolerance to this approach. Oral intake and early mobilization were provided 8 h postoperatively. Antibiotics and analgesics were used on the demand. Meticulous care for wound dressings and removal of abdominal drains within 3–5 PODs were the other key factors that should be emphasized to achieve an uneventful recovery period. In addition, ensuring the patient, his/her companion, and relevant health workers comply with simple precautions such as wearing masks, social distance, and hygiene” during their hospital stay was indeed the key point to avoid contamination. We were proud to declare that none of our patients acquired COVID-19 during the study period. Moreover, our perioperative approach also provided us with successful early postoperative outcomes with regard to surgery-related complications.

Based on the histopathologic examination results highlighted in the Results section, it can be emphasized that current imaging studies are still inferior to histopathological examination in determining the exact clinical stage of all GIS cancers. Particularly, considering the outcomes of two patients with rectal cancer who may also be evaluated for “watch & wait response”, it is obvious that deferring surgery leads to poor prognosis of these patients. Likewise, the same view can be shared regarding all cancers of GIS.^{12–14,16,27} In a recent study by Kucejko et al.,²⁸ it was found that patients with colon cancer who underwent surgery within 3–6 weeks from initial diagnosis had better 5-year survival than the delayed ones. It is strongly emphasized that surgery is the mainstay of treatment for any precancerous lesion or cancer of GIS, and no alternative treatment including chemotherapy or radiotherapy can substitute the same. Therefore, surgery should not be postponed depending on low evidence-based recommendations, which are mainly composed of expert opinions or retrospective studies including biases.¹²

None of the included patients acquired COVID-19 infection within postoperative 60 days. Although this study included 60-days follow-up results to present homogenized data, off the record, the data of all

patients were regularly checked in our national health care recording system whether infected with COVID-19 during their adjuvant treatments. Among the 92 patients who completed their postoperative 6 months, only one patient with gastric cancer was infected by COVID-19 at 6 months, followed by completion of adjuvant treatment and survived with medical treatment in 20 days without hospitalization. Considering the short study period as well as the number of patients included in this study, the authors assume that this was a remarkable midterm outcome that reveals the risk of COVID-19 infection during the treatment process of patients with GIS cancer. The current outbreak did not have any impact on the deterioration of postoperative care of patients with GIS cancer with regard to adjuvant treatment. In other words, this outcome was likely a response to the concerns of both patients and clinicians. We reiterate that we struggled with cancer-related complications rather than COVID-19 complications during this period. For this reason, we place emphasis on the fact that deferring any suspicious lesions in GIS may yield more negative outcomes than COVID-19. If the patients and medical staff strictly adopt simple precautions that block the transmission of the virus during the treatment process, regardless of the stage of GIS cancer, surgery should be continued where resources and configuration of the hospital are available.

There are limitations inherent to the retrospective nature of this study. Moreover, it reflects the outcomes of a single center. It lacks randomization; however, this method seems to be unethical for these groups. Although the limited number of patients can be considered as a limitation, considering the unprecedented period, it may suffice for reaching some preliminary conclusions.

7 | CONCLUSION

As a pandemic hospital treating both patient groups, the COVID-19 outbreak did not pose a potential threat that interferes with the treatment algorithm of patients with GIS cancer. It has been demonstrated that GIS cancer surgery can be safely performed even within a pandemic hospital if proper isolation can be achieved for both patients and health workers. Regardless of the stage, biologic type, or precancerous lesion of GIS cancer, surgery should not be deferred depending on unstandardized algorithms, thereby, inevitably encountering GIS complications or evolution to inoperability related to delay. In addition, according to the 60-days follow-up results, neo/adjuvant treatments of the patients can be performed without the influence of outbreak by strict adherence to simple precautions that can protect the patients from contamination by COVID-19. This study reflects a single-center experience; therefore we are aware that our outcomes should be compared with comprehensive studies to make an exact comment on GIS cancer surgery during pandemics.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

Alper Sozutek: *design of the study, interpretation, and original manuscript draft*; Ahmet Seker: *data analysis*; Adnan Kuvvetli: *acquisition of data*; Nazmi Ozer: *critical revision of the paper*; Ismail Caner Gen: *acquisition of data*.

DATA AVAILABILITY STATEMENT

The data are available from the authors on reasonable request.

ORCID

Alper Sozutek  <http://orcid.org/0000-0003-1039-9011>

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