



# Elective Gastrointestinal Surgery in COVID Times

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## Abstract

With the COVID pandemic claiming deaths the world over, the healthcare systems were overburdened. This led to the cancellation and delay in elective surgical cases which can have far-reaching consequences. This study reports our experience of elective gastro-intestinal surgical procedures during the COVID pandemic, after instating preventive strategies and screening protocols to prevent the transmission of COVID infection. This is a case series analysis of elective gastro-intestinal surgical procedures performed from March 24, 2020, to July 31, 2020. During this period, 314 gastro-intestinal surgical procedures were performed; of which, 45% were for malignancies. The median age of patients was 54 years (range 8 to 94 years). Laparoscopy was used in 43% cases. Major postoperative complications (Clavien-Dindo grade 3 and above) were witnessed in 3.5% (11/314) patients, with no statistically significant difference when compared with the rate of major complications last year (45/914, 4.9% vs 11/314, 3.5%,  $p = 0.3$ ). The 30-day mortality rate was 1% ( $n = 3$ ). No patient developed COVID in the postoperative period. With preventive and screening strategies and proper patient selection, it is possible to deliver safe GI surgical services during the COVID pandemic, without increasing the risk for major postoperative complications.

**Keywords** COVID 19 · Pandemic · Gastro-intestinal surgery · Postoperative complications

## Introduction

The COVID pandemic adversely affected life all over the world. The healthcare systems were challenged and crippled due to the sudden surge of a large number of sick patients. Since there was no previous experience with the disease, there was confusion and uncertainty about the appropriate prophylaxis and treatment. Surgical procedures in hospitals nearly stopped as the available resources were diverted to COVID patients. The patients who needed elective surgery were

scared to visit the hospitals because of their legitimate fear of getting infected. The widespread “lockdowns” with the cessation of all forms of public transport further added to the problem, as patients could not reach the hospitals even if they wanted. Surgeons were also reluctant to operate because of the potential risk of the transmission of infection to the patients and healthcare workers. Like never before, the concept of conserving work force was realized, in case a crisis precipitated. In times of this pandemic, some patients definitely suffered because of delays in surgery, and the real extent of the damage caused by this delay is not easy to assess.

India reported the first case of COVID 19 on January 30, 2020, followed by a nationwide lockdown from March 24, 2020, onwards. Healthcare resources were regulated to optimize services for patients with COVID infection, and elective surgeries nearly stopped in most hospitals. Despite these problems, we were approached by many patients for surgical treatment, and we did agree to operate on some of these patients. These decisions were not easy, because of the unfortunately unique circumstances where both the patient and the surgical and anesthesia teams were at risk of getting infected. This paper shares the experiences of a functioning surgical unit in COVID times in the pattern of the selection of patients for surgery and the overall results of surgery and the efficacy of the preventive strategies.

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## Methods

This is a retrospective review of the surgeries performed in the Department of GI Surgery, GI Oncology, Bariatric, and Minimal Access Surgery, at Medanta—The Medicity, Gurugram, Haryana, a tertiary level referral center of North India, between March 24, 2020 and July 31, 2020. We studied the indications of surgery and postoperative outcomes and assessed the various precautions taken and protocols followed to prevent the transmission of COVID infection to patients and the members of the treating surgical unit. The approval from the Institutional Review Board was obtained (MICR–1141/2020) and a waiver from the Ethics Committee obtained given the retrospective nature of this study.

### Preoperative Screening and COVID Testing

A three-tier screening strategy was adopted. All patients were screened in the outpatient department for possible COVID-related symptoms, recent history of travel, and contact with positive patients. If any of these were positive, a physician was involved, and surgery was deferred for 2 weeks whenever feasible. All patients underwent preoperative COVID testing, using real-time reverse transcriptase polymerase chain reaction (RT-PCR) test on a nasopharyngeal swab, performed within 48 h before surgery. If clinical suspicion persisted with a negative swab, a CT chest was performed to reliably rule out an ongoing COVID infection. All patients were counseled regarding the need for necessary precautions in the hospital, and a separate consent was obtained for admission/treatment and surgery during COVID times.

### In-Hospital Admission and Triaging

The hospital, being actively involved in treating COVID patients, undertook various measures like setting up a dedicated flu clinic, the segregation of buildings into COVID and non-COVID blocks, the separation of entry/exit, and the complete isolation of the movement circuit for COVID-positive or suspected patients. Inpatient areas were divided into four zones: “red”: COVID-positive patients; “orange”: untested with COVID symptoms; “yellow”: untested with no COVID symptoms; and “green”: COVID-negative after testing. Patients were planned for elective surgery only after being shifted to the green zone. The team of healthcare providers was separated into COVID and non-COVID teams, maintained on a rotating schedule, minimizing crossover as far as possible. In case of the exposure of a member of the non-COVID team to a positive patient, strict contact tracing was performed, followed by quarantine or testing as indicated.

## Patient Selection for Elective Surgery

During the initial phase of the pandemic, elective surgical procedures were largely suspended. Once inpatient protocols were established and surgical services could be safely delivered, patients were assessed for elective surgery. All patients with proven or suspected malignancies of the GI tract were admitted and evaluated for their fitness for surgery as per the existing policies of the department. Patients with the American Society of Anesthesiologists (ASA) grade I/II, who understood concerns with surgery under such circumstances, were preferentially selected for operations. Elderly patients with cancers and comorbidities and those who could be offered preoperative therapy were referred to medical oncology and internal medicine teams respectively for optimal management. Patients who had completed neoadjuvant therapy and were due for surgery were followed on teleconsultations and called to the hospital only when the surgery could be planned. Fit and young patients, who had completed adjuvant therapy, due for secondary procedures like stoma closures, and wished to be operated upon, were also considered.

Patients with benign diseases were discouraged for surgery during this period. Patients with cholecystitis or appendicitis whose symptoms persisted despite medical treatment were taken up for surgery. Patients improving on medical management were asked to wait for elective surgery after the stabilization of the COVID condition.

### Operating Room Precautions

The movement of personnel in and out of an operating room was kept to a minimum [1]. The anesthetists used complete personal protective equipment (PPE) (N95 masks, face shield, cap, gloves, and non-porous disposable gowns) for all patients irrespective of COVID testing report and previous exposure [2]. The surgical team was allowed to enter the operating room only 10–15 min after the intubation of the patient to allow possible aerosols to settle. The PPE used by the surgical team included N95 masks, gloves, cap, face shields, and regular cloth gowns, for all COVID negative patients. Complete PPE, along with disposable non-porous gowns, were used for patients for whom preoperative COVID testing could not be performed. Two operating theaters were segregated and dedicated for surgeries in COVID positive patients or for emergency surgeries for which the COVID report was not available. Post-operatively, patients were nursed in COVID-negative wards, as they have tested negative before the operation. Minimal movement was allowed across the floors. Visitors were restricted, and only one attendant was allowed with the patient. Patients were counseled about early discharge and follow-up on tele-consultation where clinically deemed fit.

## Precautions during laparoscopic surgery [3–5]

For laparoscopic surgery, new trocars were used to avoid peritrocar leak. For the proper disposal of carbon dioxide, an underwater seal connected to suction was used, which was connected to an HMEF (heat and moisture exchange filter) at both ends. The underwater seal contained 1% sodium hypochlorite solution. Once placed, the ports were not used to evacuate smoke or for desufflation unless connected to an underwater seal disposal system. The specimen was removed only after the complete evacuation of carbon dioxide followed by port site closure.

## Data Collection and Analysis

Clinical, demographic, and surgical parameters of the patients undergoing surgery during this period were retrospectively collected from the electronic hospital information system and medical records department. The data on cancer surgeries was derived from our prospectively maintained database. This data was compared with the surgical results and trends of the same period last year (2019), obtained from our annual audit. Complications were classified according to Clavien-Dindo classification [6]. Thirty-day mortality was defined as death occurring within 30 days of surgery because of any medical or surgical cause. Re-admissions were defined as any re-admission occurring as a result of complication/sequelae of the surgical process, within 30 days of discharge. Descriptive analysis of quantitative parameters was expressed as median with interquartile range (IQR). Categorical data were expressed as absolute numbers and percentages. The Mann-Whitney *U*-test was used for testing of the median age between two independent groups. Cross tables were generated, and Chi-squared test was used for testing of associations. Two-proportion *Z* test was used for testing of the proportion difference. *P* value < 0.05 is considered statistically significant. All analysis was done using SPSS software, version 24.0.

## Results

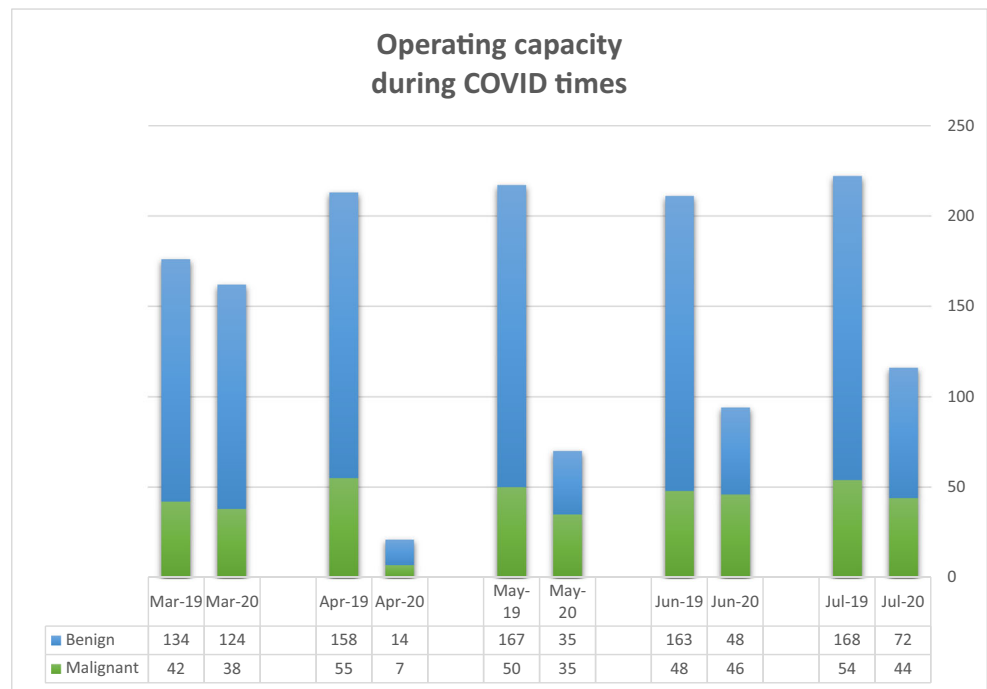
Between March 24, 2020, and July 31, 2020, 314 GI surgical procedures were performed. The department operated at 10% of its capacity in April 2020, which improved to more than 40% in June 2020 and to about 50% operative capacity in July (Graph 1). Two-thirds of these patients were men. The age of the patients ranged from 8 to 94 years, with a median age of 54 years. About 10% (31/314) were in their 8th decade of life or more. The median age of these patients was not significantly different from the median age of patients in prior months

(54 years [8–94] vs 52 years [14–90], *p* value = 0.45). Of these, 141 surgeries (44.9%) were performed for malignancy, and 23 (17.3%) had received preoperative therapy. The proportion of cancer surgeries performed during this period was significantly higher than those from the same quarter last year (23.5% in 2019 vs 44.9% in 2020, *p* < 0.0001). The spectrum of surgeries performed for GI cancers is described in Table 1. Laparoscopy was performed where indicated and executed uneventfully with the help of an underwater seal suction system to dispose carbon dioxide used for the creation of pneumoperitoneum. Of 314 procedures, 140 procedures (43.3%) were performed laparoscopically or required the use of laparoscopy for staging or diagnostic purposes.

Major postoperative complications (Clavien-Dindo grade 3 and above) [6] were seen in 11 patients (3.5%), and grade 1 and 2 complications were seen in 119 patients (37.9%) (Table 2). The incidence of major postoperative complications was not statistically higher than that of last year (45/914, 4.9% vs 11/314, 3.5%, *p* = 0.3). The rate of surgical site infections declined during this period, though not statistically significant (43/914, 4.7% vs 12/314, 3.8% *p* = 0.3). The 30-day mortality rate was 1% (*n* = 3). One of these was a patient with acute severe necrotizing pancreatitis who underwent necrosectomy; the second patient had locally advanced caecal carcinoma who underwent right hemicolectomy, end ileostomy, and distal mucous fistula; and the third patient was a case of metastatic pancreatic cancer with bowel obstruction. The cause of death in them was sepsis leading to multi-organ dysfunction. The 30-day mortality rate was comparable to that of 2019 (11/914, 1.2% vs 3/314, 1%, *p* = 0.77). Until the submission of this paper, 6 patients (1.9%) have been readmitted, 4 with poor oral intake following cancer surgery, one with acute kidney injury, and one with postoperative ileus. On comparing with surgical results of the same period of the previous year, the total number of operative cases was significantly less, but the absolute number of cancer surgeries was similar.

Six out of 314 patients (1.9%) were detected to be COVID positive during preoperative workup (4 malignancy cases and 2 benign), who were all asymptomatic carriers. Their surgery was deferred by 3 weeks and planned once the RT PCR turned negative on repeat testing. All of these patients had an uneventful postoperative recovery, with no complications. None of the surgical patients developed COVID-related symptoms in the postoperative period or required testing while in the hospital.

One of the surgeons developed minor flu-like symptoms but tested negative for COVID on the RT PCR of nasopharyngeal swab and improved on symptomatic treatment. Two residents and one consultant were quarantined for 2 weeks each, after exposure to positive patients.

**Graph 1** Operating capacity during COVID times

## Discussion

Our experience taught us that there are three main challenges in surgery during the COVID pandemic, namely, how to select patients for elective surgical procedures; modifications, if any, of the existing treatment and surgical protocols; and ensuring the safety of patients and the healthcare personnel involved. This study shows that with judicious selection and the requisite precautions, it is not unsafe to perform elective GI surgery during the pandemic. The mortality and morbidity of the patients operated by us during this period were no different from those of earlier months. This can encourage other

surgical units and influence the hospital administrators to restart the suspended elective surgical operations.

With the pandemic showing no signs of improvement and no reliable preventive treatment, there was an expected decrease in the number of patients seeking surgical care. About 38% of oncology work was cancelled globally [7] with only 10% of major pancreato-biliary centers in the world operating at 75–100% of their usual operating capacity [8]. With the aim of avoiding delays in the surgical management of patients who needed it the most, we restructured the outpatient department to ensure patient and physician safety. Tele-consultations were performed extensively to maintain the line of care and

**Table 1** Surgeries performed for malignancy from March 24, 2020, to June 30 2020

Surgeries	Post-neoadjuvant treatment	Bleeding or obstructing tumors	Upfront surgical resection	Total
Esophagectomy	4		2	6
Gastrectomy	3	3		6
Pancreaticoduodenectomy	4		14	18
Distal pancreatectomy			2	2
Pancreas preserving duodenal resection		1	1	2
Hepatectomy	2			2
Small bowel resection		2	1	5
Colectomy	3	7	9	19
Rectal resection	9	1	9	19
Biopsies/diagnostic or staging procedure	3		13	16
Creation or closure of stoma	15		8	23
Others	8	4	11	23

**Table 2** Comparison of surgical trends and results for the years 2019 and 2020 for the same quarter (March 24 to July 31)

Parameter		2019	2020	<i>p</i> value
Number of surgeries	March 24 to July 31	51	13	
	April	213	21	
	May	217	70	
	June	211	94	
	July	222	116	
	Total	914	314	
Cancer surgeries		215 (23.5%)	141 (44.9%)	0.0001*
Age	Range (years)	14–90	8–94	0.45
	Median (years)	52	54	
Sex	Male	574 (62.8%)	222 (70.7%)	0.011*
	Female	340 (37.2%)	92 (29.3%)	
ASA grade	I	591 (64.7%)	195 (62.1%)	0.029*
	II	225 (24.6%)	97 (30.9%)	
	III	98 (10.7%)	22 (7%)	
Complications	Surgical site infections	43 (4.7%)	12 (3.8%)	0.303
	CD grades 1 and 2	308 (33.7%)	119 (37.9%)	
	CD grades 3 and 4	45 (4.9%)	11 (3.5%)	
Thirty-day mortality		11 (1.2%)	3 (1%)	0.774
Re-admission rates		22 (2.4%)	6 (1.9%)	0.608

\**p* value < 0.05, statistically significant

guide the management of surgical patients, especially those with GI cancers. Although elective procedures were largely cancelled or postponed in the month of April, once inpatient protocols were established, delivering safe surgical services appeared feasible. The majority of patients operated during this period were cancer patients, with many of them with rectal or upper GI malignancies who had completed neoadjuvant therapy and were waiting on surgical resections. We prioritized their care, through proactive reach-out programs and counseling, facilitating a safe access to surgical services. Young and fit patients, who were diagnosed with malignancy during this period and did not warrant preoperative therapy, were also taken up for surgery (36.2%). Patients with borderline tumors and patients with multiple comorbidities were offered preoperative therapy and medical management to optimize their comorbidities. This led to a significant decrease in ASA 3 patients during this period compared with that of the previous year (10.7% vs 7%,  $p = 0.029$ ). Surgery for benign disease was planned only for those who continued to remain symptomatic despite optimal medical management. The most common indications were appendicitis and cholecystitis, which failed during non-operative treatment. Given the morbidity associated with pancreatitis, patients with biliary pancreatitis were planned for cholecystectomy as per routine protocols. Other patients were followed up with tele-consultations and were advised to undergo surgery only if medical management failed.

The increased risks of surgery during COVID times have been highlighted in a study from China suggesting that COVID-positive patients were more likely to require mechanical ventilation and ICU stay and had a higher chance of death [9]. Another study reported the increased risk of SARS-Cov-2 (severe acute respiratory syndrome Coronavirus-2) infection in cancer patients (OR 2.31, 95% CI: 1.89–3.02) [10]. We did not experience a high rate of SARS-Cov-2 positivity in malignant patients, and neither did we experience an increase in postoperative complications during this period. We did observe a statistically non-significant decline in the number of surgical site infections which might have been because of decreased operative room traffic, extensive hand hygiene, and limited patient mobility with decreased interpersonal association among admitted patients. We experienced an “all case mortality rate” of 1%, which was definitely not higher than the “all-case surgical mortality rate” for the year 2019 at 1.2%. In addition, none of our patients developed COVID-like symptoms in the postoperative period or required retesting.

While recommendations exist from various surgical societies, suggesting a delay in surgical procedures with more aggressive use of preoperative therapy, there remains a concern about chemotherapy-induced immunosuppression in malignant patients, which may hypothetically increase the incidence and the severity of COVID infections in them. None of our patients who had received chemotherapy developed COVID infection postoperatively or on follow-up till the submission of this paper. The quality of evidence for avoiding the

use of laparoscopy and the complete use of level 3 PPE (including hazmat suits) is also rather poor [11]. We do not propagate the routine use of hazmat suits for patients who have cleared COVID screening protocols, in favor of conserving resources and minimizing excessive costs. Many authorities have raised concerns about the dissemination of virus during minimal access surgery based on experience with other viruses [4, 12]; however, the evidence is not replete on the risk of transmission of the SARS-Cov-2 virus in surgical smoke [5]. We used level 2 PPE [2] for surgical staff and continued the use of laparoscopy as usually indicated and did not experience any adverse events with the same.

Preoperative screening protocols not only protect the patients, but also decrease the chances of exposing doctors and staff to the virus. The three-tier screening system helped us in ensuring safe clinical practice both for the patients and healthcare workers. Nasopharyngeal samples were used for RT PCR testing as the sensitivity in nasopharyngeal samples has been shown to be higher [13]. Real-time reverse transcriptase PCR is considered as a simple qualitative assay with high specificity [14, 15]. Although solo reliance on COVID testing may be inadequate, combining with clinical parameters and imaging where relevant increases the accuracy of the test [14–16]. The prompt quarantine of exposed healthcare personnel and a robust contact tracing system helped in securing a safe working environment for the department.

Most previous publications express opinions and concerns regarding surgery in COVID times, while some focus on issues regarding resident training. Ours is one of the few studies which shares the result of the actual conduct of surgical procedures during the peak of the pandemic. Apart from preoperative screening and the precautions we undertook to prevent the spread of infection, there was no alteration in the protocols and the conduct of surgical procedures. We do realize that the number of procedures performed is small, but we were able to re-establish our services to 40% of the baseline over a period of 6 weeks and have been improving ever since. Since the pandemic has not been fully resolved and there is no end in sight, patients who need surgery cannot be made to wait any longer. The fact that the complication rate and mortality in our series were no higher shows that gastrointestinal surgical procedures can be safely performed during the pandemic. Encouraging reports are also available from other centers of continuing cancer surgeries with relevant precautions [17–19]. Such mini-victories can help in laying ground rules for delivering successful and safe surgical work during the subsequent waves of the pandemic.

## Conclusion

By using structured preoperative triaging systems, adequate patient selection, and segregation of COVID and non-COVID

circuits, it is possible to deliver safe surgical care to patients who deserve it, without increasing the virus spread among patients or healthcare providers.

**Author Contribution** Deeksha Kapoor: Study design conception, data acquisition, interpretation and analysis, drafting of the article, critical review for intellectual content, final drafting, and approval of the manuscript.

Azhar Perwaiz: Study design, critical review for intellectual content, final drafting, and approval of the manuscript.

Amanjeet Singh: Study design conception, critical review for intellectual content, and final approval of the manuscript.

Adarsh Chaudhary: Study design, critical review for intellectual content, final drafting, and approval of the manuscript.

The work has been performed in the Department of GI Surgery, GI Oncology, Minimally Invasive and Bariatric Surgery, Medanta—The Medicity, Gurugram, Haryana, India.

**Compliance with Ethical Standards** The approval from the Institutional Review Board was obtained (MICR–1141/2020) and a waiver from the Ethics Committee obtained given the retrospective nature of this study.

We the authors, Deeksha Kapoor, Azhar Perwaiz, Amanjeet Singh, and Adarsh Chaudhary, have obeyed and complied with ethical standards.

**Conflict of Interest** The authors declare that they have no conflict of interest.

## References

1. Chang D, Xu H, Rebaza A, Sharma L, Dela Cruz CS (2020) Protecting health-care workers from subclinical coronavirus infection. *Lancet Respir Med* 8(3):e13
2. National Infection Prevention and Control Manual – National Services Scotland Website (<http://www.nipcm.hps.scot.nhs.uk/appendices/appendix-16-best-practice-aide-memoire-for-levels-of-personal-protective-equipment-ppe-for-healthcare-workers-when-providing-patient-care/>)
3. Spinelli A, Pellino G (2020 Jun) COVID-19 pandemic: Perspectives on an unfolding crisis. *Br J Surg* 107(7):785–787
4. De Simone B, Chouillard E, Di Saverio S, Pagani L, Sartelli M, Biffi W et al (2020) Emergency surgery during the COVID-19 pandemic: What you need to know for practice. *Ann R Coll Surg Engl* 102(5):323–332
5. Mowbray NG, Ansell J, Horwood J, Cornish J, Rizkallah P, Parker A et al (2020) Safe management of surgical smoke in the age of COVID-19: COVID-19 surgical smoke. *Br J Surg*. <https://doi.org/10.1002/bjs.11679> [cited 2020 Jul 24]
6. Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, de Santibañes E, Pekolj J, Slankamenac K, Bassi C, Graf R, Vonlanthen R, Padbury R, Cameron JL, Makuuchi M (2009 Aug) The Clavien-Dindo classification of surgical complications: Five-year experience. *Ann Surg* 250(2):187–196
7. COVIDSurg Collaborative (2020) Elective surgery cancellations due to the COVID-19 pandemic: Global predictive modelling to inform surgical recovery plans: Elective surgery during the SARS-CoV-2 pandemic. *Br J Surg*. <https://doi.org/10.1002/bjs.11746> [cited 2020 Jul 23]
8. Balakrishnan A, Lesurtel M, Siriwardena AK, Heinrich S, Serrablo A, Besselink MGH, et al (2020) Delivery of hepato-pancreato-biliary surgery during the COVID-19 pandemic: An European-

- African Hepato-Pancreato-Biliary Association (E-AHPBA) cross-sectional survey. HPB. S1365182X20310406
9. 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(3): 335–337
  10. Yu J, Ouyang W, Chua MLK, Xie C (2020) SARS-CoV-2 Transmission in patients with cancer at a tertiary care hospital in Wuhan, China. *JAMA Oncol* 25 [cited 2020 Jul 5]; Available from: <https://jamanetwork.com/journals/jamaoncology/fullarticle/2763673>
  11. Hajibandeh S, Hajibandeh S, Maw A (2020 Aug) Recommendations on key practical measures in laparoscopic surgery during the COVID-19 pandemic: N/A. *Br J Surg* 107(9): e316–e317
  12. Zheng MH, Boni L, Fingerhut A (2020) Minimally invasive surgery and the novel coronavirus outbreak: Lessons learned in China and Italy. *Ann Surg* 272(1):e5–e6
  13. Wang H, Liu Q, Hu J, Zhou M, Yu M, Li K, Xu D, Xiao Y, Yang JY, Lu YJ, Wang F, Yin P, Xu SY (2020) Nasopharyngeal swabs are more sensitive than oropharyngeal swabs for COVID-19 diagnosis and monitoring the SARS-CoV-2 load. *Front Med* 7:334
  14. Shen M, Zhou Y, Ye J, Abdullah AL-maskri AA, Kang Y, Zeng S et al (2020) Recent advances and perspectives of nucleic acid detection for coronavirus. *J Pharm Anal* 10(2):97–101
  15. Wang Y, Kang H, Liu X, Tong Z (2020) Combination of RT-qPCR testing and clinical features for diagnosis of COVID-19 facilitates management of SARS-CoV-2 outbreak. *J Med Virol* 92(6):538–539
  16. Tahamtan A, Ardebili A (2020) Real-time RT-PCR in COVID-19 detection: Issues affecting the results. *Expert Rev Mol Diagn* 20(5): 453–454
  17. Rodríguez-Sanjuán JC, Castanedo S, Toledo E, Calleja P, Jimeno J, Gómez M, Anderson EJ, Gutiérrez-Baños JL (2020) Safety of cancer surgery during the COVID-19 pandemic: Safety of cancer surgery during the COVID-19 pandemic. *Br J Surg* 107(9):e314–e315
  18. Rompianesi G, Shankar S, Reddy S, Silva M, Soonawalla Z, Friend PJ (2020) Caught in the crossfire: hepato-bilio-pancreatic cancer surgery in the midst of COVID-19: N/A. *Br J Surg* 107(9):e309–e310
  19. Shrikhande SV, Pai PS, Bhandare MS, Bakshi G, Chaukar DA, Chaturvedi P et al (2020) Outcomes of elective major cancer surgery during COVID 19 at Tata Memorial Centre: Implications for cancer care policy. *Ann Surg* 8 [cited 2020 Jul 25]; Publish Ahead of Print. <https://doi.org/10.1097/SLA.0000000000004116>
- This is a retrospective analysis of elective surgical work performed during the COVID pandemic, the preventive strategies adopted and postoperative outcomes. This paper represents the original work performed by the authors and is the product of professional research.
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