

RESEARCH ARTICLE

Continuing surgical care in cancer patients during the nationwide lockdown in the COVID-19 pandemic—Perioperative outcomes from a tertiary care cancer center in India

Esha Pai MCh | Saumya Chopra MS | Deepak Mandloi MS |
Arvind K. Upadhyay MBBS | Amar Prem MCh | Durgatosh Pandey MCh 

Department of Surgical Oncology, Homi Bhabha Cancer Hospital, Tata Memorial Centre, Varanasi, Uttar Pradesh, India

Correspondence

Durgatosh Pandey, MCh, Professor & Head, Department of Surgical Oncology, Homi Bhabha Cancer Hospital, Tata Memorial Centre, Varanasi, Uttar Pradesh 221 005, India.

Email: durgatosh@gmail.com

Abstract

Background: The coronavirus disease-2019 (COVID-19) pandemic has disrupted management of non-COVID-19 illnesses, including cancer. For many solid organ cancers, surgical intervention is imperative. We present our experience with major operations during a nationwide lockdown.

Method: This was an observational study of 184 patients, analyzing their perioperative outcomes and categorizing morbidity according to Clavien-Dindo Classification. Strict screening required symptomatic patients to be referred to COVID centers and their operations postponed. Continuous and categorical variables were expressed as medians with range and frequencies and percentages, respectively. A two-sided $\alpha < .05$ was statistically significant.

Results: During the lockdown, we initiated a graded response over four phases: (I) 24 March to 14 April (18 procedures); (II) 15 April to 3 May (26 procedures); (III) 4 to 17 May (41 procedures); and (IV) 18 to 31 May (99 procedures). The rates of major perioperative morbidity were 10.9% and mortality 1.6%. Over the four phases, the major morbidity rates were 11.1%, 15.4%, 9.8%, and 13.1%. On multivariate analysis, an emergency procedure was the only significant factor associated with morbidity. During the study period, no hospital staff became symptomatic for COVID-19.

Conclusion: In a region with milder impact of COVID-19, treatment of cancer patients need not be deferred. Our study showed that with appropriate precautions, asymptomatic patients may undergo operations without increased morbidity to them and hospital staff.

KEYWORDS

cancer surgery, COVID-19, perioperative outcomes

1 | INTRODUCTION

In the wake of the devastating pandemic of COVID-19 that has swept the world, much of the health infrastructure and manpower

has been diverted towards containment and treatment of this illness. As a consequence, routine care of non-COVID illnesses has been severely disrupted. Cancer care is no exception. Being an unprecedented situation, the recommendations for cancer care, and

cancer surgery in particular, over the last few months have been continuously evolving. The majority of associations and guidelines recommend clinical triage of patients based on various disease sub-sites or biology.¹ However, as these guidelines are based on expert opinion rather than solid evidence, emphasis was placed on individualization of treatment planning taking into account patient factors, available health care resources and local epidemiological conditions.² For many solid organ cancers, surgery remains the mainstay of treatment, and cannot be postponed indefinitely, given the uncertainty of the timeline for cessation of propagation of the epidemic.

In India, a nationwide lockdown was imposed on 24 March 2020 that continued in four phases until 31 May 2020. Ours is a stand-alone cancer center in a city and state with a relatively low number of COVID-19 cases. Hence, instead of following most other medical institutions and hospitals in the country that completely closed their elective services during that time period, we initiated a graded response to the COVID-19 threat. In this article, we review our experience with major operative procedures performed at Homi Bhabha Cancer Hospital, Varanasi during the period of the nationwide lockdown.

2 | METHODS

This was an observational study from 24 March to 31 May 2020, during four phases of a nationwide “lockdown” at a tertiary care cancer hospital in northern India. The government of India initially announced a 3-week nationwide lockdown from 24 March to 14 April 2020 (Phase I). Subsequently, the lockdown was extended in 3 more phases: Phase II (15 April to 3 May); Phase III (4 to 17 May) and Phase IV (18 to 31 May). We analyzed a prospectively maintained database to evaluate the perioperative outcomes, morbidity, and mortality in patients who underwent major surgical procedures. Morbidity was categorized according to the Clavien-Dindo Classification.³ Preoperative COVID-19 testing for all patients was not mandatory. Patients were first screened for active infection or chances of being asymptomatic carriers based on history and clinical findings and were tested only if the initial screening was positive. Any patients with symptoms of fever, cough, breathlessness, or any other complaints raising suspicion of COVID-19 infection, were referred to a COVID Center for testing and their operations were postponed for at least 2 weeks.

All procedures were undertaken according to the institutional protocol, using appropriate personal protection equipment and operational precautions. All staff with fever or flu-like symptoms were evaluated at the fever clinic, tested for COVID-19, and were given leave when recommended by the staff physician.

This study was in accordance with the Helsinki Declaration of 1975, revised in 1983. Informed consent was obtained from all patients regarding the unknown (and possibly increased) risks of surgery during pandemic circumstances. All statistical analyses were performed with the SPSS (version 21.0) software. Continuous

variables were presented as medians with range, and categorical variables were expressed as frequencies and percentages. A two-sided α of less than 0.05 was considered statistically significant.

3 | RESULTS

There were 1213 procedures, which were done over approximately 2 months. There were 184 major and 100 minor procedures, along with 929 other procedures, such as intercostal drain insertions, bone marrow biopsies, core, and open biopsies, intrathecal and intravesical administration of drugs. The 184 patients who underwent major procedures were the subjects of this study.

Patient care, for the 184 patients having major procedures, was distributed over four time periods (phases): Phase I (24 March to 14 April) had 18 procedures; Phase II (15 April to 3 May) had 26 procedures; Phase III (4 to 17 May) had 41 procedures; and Phase IV (18 to 31 May) had 99 procedures.

The most common major operations were those for breast cancer (52 of 184—28.3%), which constituted the majority of the procedures performed during Phase I (Table 1). Head and neck procedures, most of which were composite resections of the oral cavity, comprised 39 of 184 (21.1%) cases and were started in Phase II. There were also 10 (5.4%) microvascular procedures performed during Phase II for reconstruction

TABLE 1 Major OR procedures

Types of operative procedures	Number (%)
Breast (BCS, MRM)	52 (28.3)
Head and neck (oral cavity composite resections, thyroidectomy, parotidectomy, laryngectomy)	37 (20.1)
Palliative/exploratory procedures	22 (11.9)
Gynecology (IDS, RH)	17 (9.2)
Urology (RCIC, TURBT, nephrectomy, penectomy)	12 (6.5)
HPB (hepatectomy, whipple, radical cholecystectomy)	11 (5.9)
Colorectal	8 (4.3)
Thoracic (TTE, lobectomy, mediastinal mass resection)	6 (3.3)
Retroperitoneum (RP mass resections, RP-LND)	6 (3.3)
Radical gastrectomy	5 (2.7)
Extremity surgeries (limb conservation and amputations)	4 (2.2)
Chemotherapy port insertions	4 (2.2)
Total	184 (100)

Abbreviations: BCS, breast conservation surgery; HPB, hepatopancreatobiliary; IDS, interval debulking surgery; LND, lymph node dissection; MRM, modified radical mastectomy; OR, operating room; RCIC, radical cystectomy-ileal conduit; RH, radical hysterectomy; RP, retroperitoneum; TTE, Trans-thoracic esophagectomy; TURBT, transurethral resection of bladder tumor.

TABLE 2 Minor operating room procedures

Procedure	Number, %
Fiber-optic bronchoscopy/laryngoscopy	53
Suturing	18
Cystoscopy ± ureteric stenting	9
Tracheostomy	9
Chemoport removal	5
Incision and drainage	2
Direct laryngoscopy/examination under anesthesia	4
Total	100 (100)

of defects from oral cavity resections. For completeness, the various types of minor procedures performed have been listed in Table 2.

Most patients (78.3%) were less than 60 years of age, with a median age of 47 years (range, 1-79 years). Ten of 184 (5.4%) patients belonged to the pediatric age group. Women constituted 57.6% (106 of 184) of the operated patients. Upfront surgical procedures were more common than those after neoadjuvant chemotherapy (63% vs 37%). Emergency procedures constituted 17 of 184 (9.2%) operations. The median blood loss was 250 mL (range, 20-8000 mL), with 13.6% of patients (25 of 184)

TABLE 3 Perioperative characteristics

Outcome	
Emergency (%)	17 (9.2)
Elective (%)	167 (90.8)
Blood loss, mL—median (range)	250 (20-8000)
Blood transfusion—yes (%)	25 (13.6)
No (%)	159 (86.4)
Hospital stay in days—median (range)	5 (1-35)
Morbidity (CD classification)	
I (%)	4 (2.2)
II (%)	27 (14.7)
III (%)	18 (9.8)
IV (%)	2 (1.1)
Total (%)	51 (27.7)
Major morbidity (CD classification)—III and IV (%)	20 (10.9)
Major morbidity	
Phase I (%)	2 (11.1)
Phase II (%)	4 (15.4)
Phase III (%)	4 (9.8)
Phase IV (%)	13 (13.1)
Mortality (%)	3 (1.6)
Phase I (%)	00 (0)
Phase II (%)	00 (0)
Phase III (%)	11 (0.5)
Phase IV (%)	22 (1.1)

Abbreviation: CD, Clavien Dindo.

requiring perioperative blood transfusions. The median hospital stay was 5 days (range, 1-35 days) (Table 3).

One patient was tested for COVID-19 preoperatively for fever and another postoperatively for cough, both of whom were found to be negative. Although the former had Grade IIIA morbidity, the latter had Grade I morbidity.

Comorbidities were present in 66 of 184 (35.9%) patients, and multiple comorbidities were found in 8 of 184 (4.3%) patients. The most common comorbidity was hypertension (24 of 184, 13%), followed by diabetes (12 of 184, 6.5%). There were also three patients, who had a history of tuberculosis—pulmonary, cervical, and inguinal lymphadenitis, respectively (Table 4).

Overall morbidity, including Clavien-Dindo Classification Grades I-IV, occurred in 51 of 184 (27.7%) patients. Major morbidity, categorized as Clavien-Dindo Grades III & IV, occurred in 20 of 184 (10.9%) patients. The rates of major morbidity during the four phases were 11.1%, 15.4%, 9.8%, and 13.1%. Morbidity was found to be significantly more common in patients who underwent emergency procedures compared to those operated in an elective setting (41.2% vs.7.6%, $P = .001$). Neither the presence of comorbidity nor multiple

TABLE 4 Clinical characteristics and comorbidity

Variable	
Age in years—median (range)	47 (1-79)
Gender—male (%)	78 (42.4)
female (%)	106 (57.6)
BMI—median (range)	23.8 (12.5-43.5)
Smoking—yes (%)	5 (2.7)
No (%)	178 (96.7)
Comorbidities—yes (%)	66 (35.9)
No (%)	118 (64.1)
Types of comorbidities	
Hypertension (%)	24 (13)
Diabetes mellitus (%)	12 (6.5)
Hypothyroidism (%)	4 (2.2)
Chronic liver disease (%)	4 (2.2)
COPD (%)	3 (1.6)
Past history of tuberculosis (%)	3 (1.6)
Psychiatric disorders (%)	3 (1.6)
Chronic kidney disease (%)	2 (1.1)
Ischemic heart disease (%)	2 (1.1)
Seizure disorder (%)	1 (0.5)
Multiple comorbidities (%)	8 (4.3)
Previous chemotherapy—yes (%)	68 (37)
No (%)	116 (63)
Phases of lockdown	No. of patients operated
I (%)	18 (9.8)
II (%)	26 (14.1)
III (%)	41 (22.3)
IV (%)	99 (53.8)

comorbidities were found to be significantly associated with the morbidity after elective procedures. On multivariate regression analysis, an emergency procedure was the only significant factor found to be associated with morbidity. Perioperative mortality occurred in 3 of 184 (1.6%) patients, in two having elective and one having emergency procedures.

3.1 | Impact on the operating room (OR) staff

In the initial 6 weeks of the lockdown period (Phases I and II), a policy of “staff-sparing” was followed with an “alternate-week” work schedule. As our workload increased and during the last 2 weeks of the study period (Phase IV), most of the staff in the OR, including surgeons, nurses, anesthesiologists, technical and housekeeping staff, worked every day. No staff tested positive for COVID-19 during the study period. However, in the first week of June, after the duration of the study period, one surgical resident tested positive with mild influenza-like symptoms. Five OR staff, including three surgeons, an anesthesiologist, and a technical staff member who were high-risk contacts, were sent on home quarantine for 2 weeks despite all testing negative for COVID-19.

4 | DISCUSSION

Faced with a severe shortage of infrastructure and manpower because of the COVID-19 pandemic and the international response to it, there has been considerable confusion regarding the management of patients with non-COVID illnesses. Across most of the world, such patients are being triaged before treatment is offered. In India, when the nationwide lockdown was announced on 24 March 2020, in the majority of centers, most elective procedures and outpatient clinics were shut down. The government of India initially announced a three-week nationwide lockdown from 24 March to 14 April 2020 (Phase I). Subsequently, the lockdown was extended in three more phases: Phase II (15 April to 3 May); phase III (4 to 17 May) and Phase IV (8 to 31 May).

The stand-alone cancer centers were faced with a bigger dilemma. Cancer care in general and specifically cancer surgery, while being “elective” treatment most of the time, is often essential and cannot be postponed indefinitely. Delay in optimal treatment has been shown to adversely affect the outcome, making timely intervention critical.

However, literature from China brought to the forefront evidence that patients with cancer were observed to have a higher risk of severe events, intensive care, or death, compared with patients without cancer.⁴ Given this information, oncologists were faced with the clinical dilemma of whether to “treat or not to treat.” By not delaying treatment, there was a possibility of increasing short-term deaths due to the immediate threat of COVID-19. This concern was further fueled by the publication of outcomes for patients undergoing operations during the incubation period of COVID-19 infection, with 44.1%

patients needing ICU care, and a mortality rate of 20.5%.⁵ The dilemma of “treat or not to treat” was compounded by the anticipated need to “shift priorities” at centers where health care systems were already overwhelmed or potentially overwhelmed by the pandemic. These considerations resulted in the majority of tertiary care centers scaling down the number of cancer procedures being performed.

Our center is in an Indian state that was not “severely” affected by the COVID-19 epidemic from 24 March through 31 May 2020, the duration of this study. With a population of approximately 223.2 million people, the number of confirmed COVID-19 patients in the state up until 31 May 2020 was 7701, and the total number of deaths was 213.⁶ In Varanasi, with a population of 4.2 million people, the number of confirmed COVID-19 patients was 170 with 4 deaths up until 31 May 2020. With this relatively low impact of COVID-19 in our geographical region, it was our opinion that shutting down cancer care did not seem justified. Hence, we decided to mount a “graded” response to the pandemic situation.⁷

Preoperative mandatory testing for all patients was not routinely done due to the limited availability of testing kits, as well as the high false negativity rate of the tests.⁸ We decided to observe appropriate precautions for all patients regardless of COVID-status, in accordance with the guidelines issued by the Indian Council of Medical Research,⁹ i.e., standard precautions were used in the outpatient clinic and wards (including adequate distancing and surface cleaning), whereas airborne precautions were used in the OR. In addition to standard precautions,¹⁰ we also used N-95 masks.

Due to a careful screening process for symptoms and contacts, only two patients underwent post-screening perioperative testing. Symptomatic patients were sent to COVID centers for appropriate testing and were recalled at least 2 weeks after becoming asymptomatic. With some modifications, the policy of triage and rationing of cancer surgery was followed as per the guidelines of the Society of Surgical Oncology.¹ Wherever indicated, neoadjuvant treatment was used liberally, and alternatives to radical surgery were explored. For example, most patients with cervical cancers underwent radical radiotherapy during this period, and those with rectal cancer were planned for neoadjuvant chemoradiation followed by a delayed waiting period of upto 12 weeks before an operation. Looking for the fine balance between protecting patients from the risks of COVID-19 infection, while not depriving them of cancer-directed therapeutic measures, it has been proposed that the “safe postponement period” ranges from 3 to 12 weeks from diagnosis.¹¹ The usual surgical waiting list for our patients was already around 4 to 8 weeks. Hence, for those patients who needed upfront surgery or for those whose neoadjuvant treatment had been completed, a further delay could potentially lead to either inoperable disease or an adverse outcome.

During Phase I of the lockdown (24 March to 14 April 2020), we performed predominantly breast procedures along with other simple procedures, as these patients were expected to have a minimal hospital stay and to have neither intensive care unit (ICU) requirement nor prolonged duration of surgery, thus entailing minimal risk to patients and hospital staff.

Oral cavity procedures, being done for one of the most common cancers in this region, were initially postponed, while awaiting evidence and formulation of guidelines for mitigating risks related to aerosol-based transmission. These procedures were resumed at the end of Phase II of the lockdown (15 April to 3 May 2020), when there was no sight of a trend towards declining of COVID-19 cases for weeks to come. Somewhat later, microvascular reconstructions for head & neck resections were also introduced.

During Phase III of the lockdown (4 to 17 May 2020), gynecological and colorectal procedures were resumed, along with radical cholecystectomies, as gall bladder cancer is a common malignancy in this geographical region.¹² This decision was based on our low morbidity rates for elective procedures, infrequent ICU admissions, no perioperative mortality, and no staff becoming positive for COVID-19. These findings may be associated with the factor that the majority of our patients were less than 60 years of age. Regional COVID-related factors which may have played a contributory role were low prevalence of COVID-19 in the region, low prevalence of "asymptomatic carriers" amongst cancer patients here, inherent resistance to infection (herd immunity), and warmer climatic conditions.¹³

Phase IV (18 to 31 May 2020) saw full functioning of ORs, when we initiated more complex procedures such as esophagectomies, pulmonary and mediastinal tumor resections, hepatectomies, pancreatectomies and complex retroperitoneal resections. Despite the increasing complexity of our cases, our morbidity showed no increasing trend, over the four phases.

Although the overall perioperative mortality rate was 1.6%, the morbidity was found to be significantly higher in patients who underwent emergency procedures compared to elective ones (41.2% vs 7.6%, $P = .002$). Comorbidities were not found to increase the postoperative morbidity of major procedures. On multivariate regression analysis, an emergency procedure was the only significant factor found to be associated with postoperative morbidity.

Delays in surgery for cancer of 3 to 6 months have been found to mitigate 19% to 43% of life years gained by hospitalization of an equivalent volume of admissions for community-acquired COVID-19.¹⁴

Given our perioperative outcomes, it was evident that recommendations for cancer care surgery cannot be generalized, perhaps even across states. If we had not mounted a graded response, curative surgical procedures for many patients would have been delayed. Thus, it is our opinion that each center must formulate its own strategy to address existing current needs and the increasing backlog of procedures to avoid a future health crisis of avoidable cancer deaths.

5 | CONCLUSION

In a geographical region with a relatively milder impact of COVID-19, optimal treatment of cancer patients need not be indefinitely deferred. Every center's individualized approach may be escalated or de-escalated, depending on the evolving severity of the pandemic in

that geographical region. Our study showed that with the appropriate precautionary measures, surgical treatment of cancer patients can be done without an increase in patient morbidity and mortality, and without increased incidence of symptomatic COVID-19 infection in the hospital staff.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTIONS

EP: data acquisition, quality control, interpretation and analysis, writing—original draft; SC, DM, AKU: data acquisition; AP: quality control of data; DP: concept and design, analysis & interpretation, writing—editing and review.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ORCID

Durgatosh Pandey  <http://orcid.org/0000-0002-3043-4892>

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