Original Articles

Postoperative outcomes in patients undergoing elective general surgery after recovery from Covid-19 at a tertiary care centre: A one-year case series

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ABSTRACT

Background. Planned elective surgery had to be postponed for a large number of patients who tested positive for Covid-19 in the preoperative period. We aimed to assess the postoperative outcomes of patients who were operated on for elective indications, following recovery from Covid-19 infection.

Methods. We did a retrospective study of patients who underwent elective general surgery between 1 April 2020 and 31 March 2021, following recovery from Covid-19. The 30-day postoperative morbidity and mortality were analysed. The data relevant for the study were retrieved from the hospital's electronic medical records.

Results. Of the 109 patients included, 54.1% were women and the median (range) age was 49 (16–76) years; 53.2% of operations were performed for benign indications and the rest were for malignancies. Eighty-five (78%) patients underwent surgery following recovery from an asymptomatic Covid-19 infection and 23 (21.1%) patients following recovery from mild Covid-19 infection; 73.3% of the operations were performed following a planned delay of 2–5 weeks from the diagnosis of Covid-19. The 30-day major postoperative morbidity (Clavien–Dindo grade $\geq$3) was 6.4%, the postoperative pulmonary morbidity was 0.9%, and there was no 30-day mortality.

Conclusions. Elective general surgical procedures can be done safely in patients who have recovered from asymptomatic and mild Covid-19 infection, following a minimum wait period of 2 weeks.

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INTRODUCTION

There was a rapid surge of Covid-19 cases during the second wave of the pandemic in India. Elective surgeries were postponed in most parts of the country, to utilize the available resources for the care of patients with Covid-19. However, elective surgeries resumed, as the pandemic situation eased. The natural course of this disease, its severity, and the virulence of the virus are dynamic and may vary across countries. Hence, the reported morbidity and mortality rates of Covid-19 infection in the global literature may not be reflective of our patient population, including surgical patients. This warrants us to study the postoperative outcomes in Covid-19-infected patients in the Indian population. Although emergency surgeries are unavoidable irrespective of the Covid-19 status, it is the elective surgical plan that can be modified, based on the patient's Covid-19 status. The time interval to surgery may influence the postoperative outcomes, especially in patients who have recovered from Covid-19.[1] However, despite a large number of elective surgeries being performed following the first wave of the pandemic, postoperative outcomes of Covid-19 recovered patients undergoing elective surgery are largely unknown in India. Hence, we studied the profile of patients who were operated on for elective general surgical indications following recovery from Covid-19 infection and their postoperative outcomes.

METHODS

This retrospective cohort study included all consecutive adult patients undergoing any type of elective operations between 1 April 2020 and 31 March 2021 in the Department of General Surgery of a tertiary care centre in southern India. The study was approved by the institutional review board. The demographic data collected included age, sex, domicile, history of smoking, and presence of medical comorbid conditions. The data on Covid-19 status, the severity of infection, time interval to surgery, surgical diagnosis, details of surgery including the type of anaesthesia, surgical approach, duration of surgery, postoperative intensive care unit (ICU) and ventilator requirement, the postoperative 30-day morbidity, especially the pulmonary morbidity and the 30-day mortality were obtained

from electronic hospital records. The nature of specific complications, if any, were documented.

As per the institutional protocol, all patients planned for an elective operation were tested preoperatively for Covid-19 infection using the reverse transcription-polymerase chain reaction (RT-PCR) test. Patients who were tested positive for Covid-19 within 102 days preoperatively were excluded from a repeat test based on the guidelines of the Indian Council of Medical Research (ICMR).[2] Based on the status of the Covid-19 test report, the patients were classified as Covid-negative, asymptomatic Covid-positive, resolved mild symptomatic Covid-positive, resolved severe symptomatic Covid-positive, and not tested for Covid. Asymptomatic Covid-positive was defined as a patient who was incidentally detected to be Covid-positive on preoperative testing and did not develop any symptoms of Covid during the quarantine period. Mild symptomatic Covid was defined as a patient with any symptoms of Covid infection not restricted to fever, cough, malaise with or without evidence of pneumonia, not requiring ICU admission. Severe symptomatic Covid was defined as a patient who developed acute respiratory distress syndrome (ARDS), organ failure, or those requiring ICU admission.[3] The primary outcome measure was 30-day postoperative mortality and the secondary outcome measure was the incidence of 30-day postoperative pulmonary complications, particularly pneumonia. New-onset postoperative pulmonary complications included the development of pneumonia, pleural effusion, pulmonary thromboembolism, ARDS and unplanned postoperative ventilation. Postoperative pneumonia was documented according to the US Centers for Disease Control (CDC) definition of pneumonia.[4] The severity of postoperative complications was classified using the Clavien–Dindo grading (CDG).[5] The postoperative follow-up was completed in the outpatient clinic at the 30-day mark. The follow-up of those patients who did not attend the outpatient clinic was completed using telephonic conversation. All data relevant for this study were obtained from the electronic medical records of the hospital. The categorical variables were reported in frequencies and percentages, and continuous variables were reported using mean (standard deviation; SD) or median (range) as appropriate. The data were entered using EpiData® 3.1 software and the statistical analysis was performed using SPSS version 23.0 (*SPSS*®,Armonk, NY: IBM Corp®).

RESULTS

The baseline characteristics of 109 patients included in the study are shown in Table I. The median age of the study group was 49 years (range 16–76 years) and there were more women (54.1%). Most patients belonged to the American Society of Anesthesia (ASA) grade 1 or 2 (95.4%). The operative approaches included open and minimally invasive. The operations done for benign conditions included perianal procedures, cholecystectomy, inguinal, incisional or ventral hernia repair, circumcision and stoma closure procedures. The cancer surgeries included mastectomy, thyroidectomy, gastrectomy, colectomy, abdominoperineal resection and radical neck dissection (Table II). The time interval between the positive Covid-19 testing and the surgery is shown in Table III.

The majority of the patients were operated following a time interval of 2–5 weeks from a positive Covid-19 test. Since there was no 30-day mortality, analysis to elucidate the effect of various time intervals on the postoperative mortality was not feasible. The 30-day postoperative pulmonary complication

TABLE I. Demographic, clinical and surgical details of the study patients (*n*=109)

Characteristic	*n* (%)
Age (in years)	
16–29	12 (11)
30–49	44 (40.4)
50–69	47 (43.1)
70–79	6 (5.5)
Gender	
Men	50 (45.9)
Women	59 (54.1)
ASA grade	
1	31 (28.4)
2	73 (67)
3	5 (4.6)
*Respiratory comorbid conditions**	
Yes	11 (10.1)
No	98 (89.9)
Indication for surgery	
Benign	58 (53.2)
Malignancy	51 (46.8)
Previous Covid-19 symptom status	
Asymptomatic	85 (78)
Resolved mild symptomatic	23 (21.1)
Resolved severe symptomatic	1 (0.9)
Duration of surgery (hours)	
≤4	102 (93.6)
>4	7 (6.4)
Type of anaesthesia	
General	100 (91.7)
Regional	9 (8.3)

* included asthma, chronic obstructive pulmonary disease, and old tuberculosis sequelae ASA American Society of Anaesthesia

TABLE II. List of elective general surgical procedures performed among the study population

Operative procedure	Number
Laparoscopic cholecystectomy	8
Laparoscopic appendicectomy	1
Composite resection—oral cancer with reconstruction	2
Infected mesh exit/debridement of flap	3
Open hernia repair: Inguinal/ventral	11
Laparoscopic hernia repair	5
Hadsfield operation	2
Heller's myotomy	2
Laparoscopic adrenalectomy	1
Mastectomy	20
Total thyroidectomy	10
Parotidectomy	1
Laparotomy with bowel resection/stoma procedure	8
Perineal fistula operation/pilonidal abscess drainage/overlap sphincteroplasty	11
Open gastrectomy: Subtotal/total/wedge	3
Open colectomy: Right/left/subtotal/sigmoid	1
Open anterior rectal resection	4
Laparoscopic/open abdominoperineal resection	7
Soft tissue sarcoma excision	1
Diagnostic laparoscopy/laparoscopic salpingo-oophorectomy	2
Omphalectomy	1
Lymph node biopsy/lump excision/split thickness skin graft	4
Circumcision	1

TABLE III. Time interval to surgery following a positive Covid-19 test

Time interval (in weeks)	*n* (%)
0 to ≤2	4 (3.7)
>2 to ≤3	24 (22.0)
>3 to ≤4	36 (33.0)
>4 to ≤5	20 (18.3)
>5 to ≤6	3 (2.8)
>6 to ≤7	3 (2.8)
>7 to ≤8	4 (3.7)
>8	15 (13.8)

TABLE IV. Postoperative morbidity and mortality

Variable	*n* (%)
30-day pulmonary complications	
Yes	1 (0.9)
No	108 (99.1)
30-day non-pulmonary complications	
Yes	12 (11)
No	97 (89)
Type of non-pulmonary complications	
Surgical site infection	4
Urinary tract infection	2
Postoperative haemorrhage	1
Anastomotic leak/stump blow out	2
Flap necrosis	1
Prolonged ileus/adhesive obstruction	1
Common bile duct injury	1
Clavien–Dindo grade	
1	4 (3.7)
2	3 (2.7)
3A	2 (1.8)
3B	4 (3.7)
4	1 (0.9)
No complications	95 (87.2)

rate was 0.9% and non-pulmonary complication rate was 11%. Overall, the 30-day major postoperative morbidity (CDG ≥3) rate was 6.4%.

In this study, there was no 30-day postoperative mortality among patients undergoing elective surgery, following recovery from Covid. Also, there were no deaths reported among the non-Covid patients who underwent elective operations in the same period. Hence, a comparison of outcome (mortality) between these groups was not relevant. The 30-day mortality rate in the same general surgery units in the 2-year period before the Covid-19 pandemic (1 April 2018 to 31 March 2020) was 0.16% (17 deaths in a total of 10 489 elective general surgery procedures). There was no statistically significant difference in mortality between this retrospective control group and the study population (0.16% *v.* 0%, p=0.67).

DISCUSSION

More than 31 million people had been affected by Covid-19 in India, based on WHO reports, at the time of this study.[6] With a decrease in the number of new cases in India, normal surgical services were resumed. A large number of patients who were planned for elective surgery for various diseases have had a previous Covid-19 infection. There was uncertainty among clinicians, surgeons, anaesthesiologists and patients, regarding the effects of Covid-19 infection on the outcome of elective surgery. The optimal time for surgery following recovery from Covid-19 was also debated. However, the knowledge of long-term, health-related consequences of Covid-19 is limited. This single-institution study aimed to assess the 30-day postoperative outcomes among patients undergoing elective operations following Covid-19 infection.

Postoperative outcomes

About 50% of the patients with perioperative Covid-19 infection develop postoperative pulmonary complications.[7] In addition to a high postoperative mortality rate, patients with perioperative Covid-19 infection are at high risk for thromboembolic complications.[7–9] A study from Italy concluded that surgery should be postponed in patients with Covid-19 because of the increased risk of mortality and postoperative complications.[10] In our study, there was no 30-day postoperative mortality and only 1 patient developed postoperative pulmonary complications. There were no reported thromboembolic events in the immediate postoperative period. The overall 30-day major postoperative morbidity (CDG ≥3) rate (6.4%) was within the acceptable range. In our study, nearly 99% of the patients underwent elective operations following asymptomatic or mild Covid-19 infection. A significant number of major elective operations, especially those that involve operations in the thoracic cavity such as oesophagectomy or those with longer operative times were suspended during the study period, which would otherwise carry a high risk of morbidity and mortality. This may have contributed to no mortality in our study.

Time interval to surgery following a positive Covid-19 test

Due to the reported adverse surgical outcomes in Covid-19 patients, routine preoperative Covid-19 testing was advocated for all elective operations. The planned surgeries were postponed if the patient was found to be incidentally Covid-19-positive on preoperative testing. However, the time interval to elective surgery from a positive Covid-19 test varied among healthcare institutions, based on the available evidence, government quarantine policies, institutional guidelines, surgeons' preferences and patient logistics. One prospective cohort study showed that cancer patients with positive preoperative Covid-19 test should have their surgery delayed for at least 4 weeks to lower the postoperative mortality.[11] There is a lack of consensus in the clinical practice guidelines from various anaesthesiology and surgical societies regarding the optimum wait period and a delay of 2–12 weeks for elective surgery is recommended, following a positive Covid-19 test.[12,13] In our study, the median wait period for elective surgery was 4 weeks (IQR 3–5 weeks). There was no clinically relevant difference in the incidence of postoperative outcomes between various time intervals. However, due to the small subgroups, a statistical analysis could not be done to identify the effect of various wait periods on the postoperative outcomes. An international, multicentre study showed that surgery done >7 weeks following Covid-19 infection had mortality rates comparable to Covid-19-negative patients.[14] In our study, the time interval to surgery following Covid-19 infection did not have a bearing on the postoperative outcomes. The ICMR guidelines concerning the waiting period for elective surgery following Covid-19 infection and the requirement for preoperative Covid testing have been evolving based on the available evidence. The initial suggestion was a planned delay of 4 weeks for asymptomatic Covid-positive patients, 6 weeks for immunocompetent patients

recovered from mild Covid disease, and 8–10 weeks for patients who recovered from mild disease, but with comorbid conditions such as diabetes or immunocompromised states. However, a waiting period of 12 weeks for elective surgery was recommended for a patient who had recovered from severe Covid disease.[2] At present, the ICMR recommends against routine Covid-19 testing in asymptomatic patients before hospital admission for any surgical or interventional procedures. This guideline was being implemented in large hospitals across the nation.[15] In our study, a majority of patients were asymptomatic when they tested positive for Covid-19 before surgery and these patients did not have any major postoperative complications. This emphasizes that preoperative testing may not be essential in asymptomatic patients before minor surgical interventions, as the risk of complications is lower in incidentally detected asymptomatic Covid-positive patients, which is in consonance with the latest ICMR guidelines, and is the practice in a few major hospitals across the nation.[15]

Severity of Covid-19 and surgical outcomes

The severity of Covid-19 infection and the associated mortality varied across different countries due to the heterogeneity in demography, the prevalence of communicable and non-communicable diseases, prevalence of autoimmune disorders and sanitation parameters.[16] A study from Brazil reported that patients with delayed elective surgeries following asymptomatic Covid-19 infection are not at a higher risk of postoperative complications.[17] In our study, only 1 patient had previous severe Covid-19 disease requiring non-invasive ventilation. However, this patient did not have any postoperative complications. It can be seen from a multicentre study that ASA grade $\geq$3 was an independent risk factor for the development of postoperative ARDS in previously Covid-positive patients, which contributes to mortality.[14] Most of our patients belonged to ASA grade 1 or 2. As shown in Table I, the majority of our patients were either asymptomatic or had recovered from the mild disease. However, patients who recovered from severe Covid-19 infection may have had their elective surgery deferred due to the patient's or healthcare team's fear of increased risk of complications. The risk of elective surgery and the optimal timing to surgery following recovery from severe Covid-19 infection is yet to be determined in a large study.

Our study had few limitations. First, it was a single institution, retrospective study with a small sample size and hence has its inherent bias. Second, the time interval to surgery following Covid-19 infection was influenced by the institutional and local governing body protocols, and available evidence was scarce at the beginning of the pandemic. Third, the study did not include most of the major elective general surgical cases, which were suspended during the study period, due to concerns about their safety. Furthermore, the study was conducted among patients who were not vaccinated previously. The postoperative outcomes and the optimal time to elective surgery in vaccinated patients are largely unknown. However, amidst the ongoing pandemic, our study showed no increased risk of mortality or morbidity among Covid-19 recovered patients undergoing elective surgeries.

Conclusions

Elective general surgical procedures can be safely performed in patients following recovery from asymptomatic and mild Covid-19 infection. Since the risk of complications is low after minor surgery in incidentally detected asymptomatic Covid-positive patients, the role of routine preoperative Covid testing is questionable in asymptomatic patients requiring minor surgical procedures. The optimal time interval to surgery following Covid-19 infection and the effect of severity of Covid-19 infection on postoperative outcomes, especially in the post-vaccination era needs evaluation in future studies.

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Conflicts of interest. None declared

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