

## Evaluation of Clinical Characteristics and Outcomes in Patients Undergoing Surgery During the COVID-19 Incubation Period

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### Abstract:

**Background and Objective:** The COVID-19 pandemic has profoundly impacted healthcare systems and treatment protocols, particularly surgical procedures. This study examines the clinical characteristics and outcomes of patients undergoing surgery during the incubation period of COVID-19 infection.

**Materials & Methods:** In this analytical cross-sectional study conducted in 2019, clinical data from surgical patients in the COVID-19 incubation period were collected and analyzed. Clinical characteristics included age, sex, type of surgery, and postoperative outcomes such as length of hospital stay and mortality. All data were entered into SPSS version 22, and statistical analysis was performed using t-tests and chi-square tests, with a significance level set at  $p < 0.05$ .

**Results:** The mean operative time for elective surgeries was  $3.87 \pm 1.12$  hours in PCR-positive patients and  $2.7 \pm 0.98$  hours in PCR-negative patients. For minor surgeries, the mean operative time was  $4.11 \pm 2.12$  hours in PCR-positive patients and  $3.5 \pm 1.14$  hours in PCR-negative patients. Major surgeries lasted  $12.3 \pm 3.3$  hours in PCR-positive patients and  $11.8 \pm 2.5$  hours in PCR-negative patients. The results revealed a statistically significant difference in recovery time between the two groups ( $p < 0.001$ ), with COVID-19 patients experiencing longer recovery periods and higher mortality rates compared to non-COVID-19 patients.

**Conclusion:** This study demonstrates that patients with COVID-19 undergoing surgery during the incubation period had prolonged recovery times and higher mortality rates than non-infected patients. These findings underscore the importance of thorough preoperative screening for COVID-19 infection before elective and non-urgent surgeries and highlight the need for precautionary measures to mitigate surgical risks in COVID-19 patients.

**Keywords:** COVID-19, Surgery, RT PCR

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## Background and Objective

The outbreak of the coronavirus disease 2019 (COVID-19) infection occurred in December 2019 in Wuhan, the capital of Hubei Province, China.<sup>1</sup> The first case of COVID-19 in Iran was officially reported on February 19, 2020, in the city of Qom.<sup>2</sup> By April 6, 2020, a total of 29,406 confirmed cases and 2,234 deaths had been reported across Iran.<sup>3</sup> Understanding the symptoms of this disease is crucial. Although the clinical manifestations of COVID-19 are nonspecific, common symptoms include fever, cough, myalgia, and fatigue.<sup>4,5</sup> Some patients may experience nausea and diarrhea before developing a fever. Generally, fever is considered one of the primary symptoms, while a small number of patients may present with headaches or hemoptysis.<sup>4,5</sup> Elderly individuals and those with underlying medical conditions are more likely to develop acute respiratory symptoms due to alveolar damage.<sup>6</sup> The disease can rapidly progress to multi-organ involvement (e.g., shock, acute respiratory distress syndrome [ARDS], acute cardiac injury, and acute kidney injury [AKI]), sometimes leading to fatal outcomes.<sup>7</sup> The incubation period for COVID-19 ranges from 3 to 14 days, during which the virus is highly contagious.<sup>8</sup> Additionally, about 1% of asymptomatic carriers can be confirmed through laboratory testing, indicating that the virus remains potentially transmissible during the incubation period.<sup>8</sup> Preventing and identifying COVID-19 infections pose significant challenges. Emergency surgeries must be performed promptly, and whenever possible, laparoscopic techniques should be employed to minimize postoperative respiratory complications.<sup>9</sup> In all cases, patients should be treated as potentially infected, and elective surgeries should be postponed until the epidemic subsides to avoid unnecessary risks.<sup>9</sup> Educating patients and their families about the medical rationale for delaying surgery is essential. Patients should also be informed that their required interventions will be postponed until the epidemic declines, as many others are awaiting treatment, a number that depends on the duration of the epidemic.<sup>9</sup> A particular concern arises for patients requiring emergency surgery. In such cases, two key factors must be considered: (1) implementing protective measures for healthcare personnel

and (2) minimizing interventions that could compromise respiratory function.<sup>9</sup> During the early stages of the COVID-19 outbreak, we encountered a small number of asymptomatic patients who underwent elective or emergency surgeries during the incubation period of COVID-19 infection.<sup>9</sup> However, the clinical manifestations and prognosis of these patients remain unclear. Currently, data on the clinical characteristics and outcomes of COVID-19 patients undergoing surgery are scarce.<sup>9</sup> Nevertheless, the impact of surgical procedures as a risk factor on immune cell function has been established.<sup>9</sup> Given the prevalence of COVID-19 in Qom Province and the lack of sufficient studies and data on the clinical features and treatment outcomes of surgical patients during the infection period, this study aimed to determine the clinical characteristics and outcomes of patients undergoing surgery between 2019 and one year later during the COVID-19 incubation period.

## Materials and Methods

This study was conducted as a cross-sectional analytical study. The study population included all surgical patients from February 2020 to one year later (February 2021). Sampling was performed using a census method. Inclusion criteria: All surgical patients with confirmed COVID-19 infection by RT-PCR test or CT scan (exposed group). Surgical patients with confirmed absence of COVID-19 infection by RT-PCR test or CT scan (non-exposed group). Exclusion criteria: Patients with other infections such as influenza, pneumonia, or other cold-like symptoms who tested negative for COVID-19 were excluded from the study.

After obtaining ethical approval (code: IR.MUQ.REC.1400.113), the researcher began reviewing patient records. All patient data, including demographic information, clinical characteristics, type of surgery, and other relevant variables, were recorded and analyzed. All data were entered into SPSS software (version 22) for analysis. Statistical tests including t-tests and chi-square tests were used for data analysis. A p-value of <0.05 was considered statistically significant for all tests.

## Results

A total of 160 patients were evaluated. The mean age of patients was  $39.8 \pm 10.9$  years, with 86 male and 74 female patients. Table 1 shows the distribution of these variables between the exposed (PCR-positive) and non-exposed (PCR-negative) groups.

**Table 1- Comparison of demographic findings between surgical patients with and without positive COVID-19 PCR tests**

Variable	COVID-19 PCR Test		p value
	Positive	Negative	
Age (Mean±SD)	38.93±8.79	40.8±12.6	0.277
Gender	Male	39 (24.4%) (29.4%)47	0.221
	Female	41 (25.6%) (20.6%)33	

The analysis of surgical procedure types revealed no significant association between COVID-19 status and surgery category ( $p = 0.288$ ), with the exposed group comprising 5 elective (3.1%), 28 minor (17.5%), and 47 major (29.4%) procedures, while the non-exposed group included 9 elective (5.6%), 33 minor (20.6%), and 38 major (23.8%) surgeries, demonstrating comparable distributions across both cohorts.

**Table 2- Frequency of surgery types in patients with and without positive COVID-19 PCR tests**

Variable	COVID-19 PCR Test		P value
	Positive	Negative	
Surgery Type	Elective	(3.1)5 (5.6)9	0.288
	Minor	(17.5)28 (20.6)33	
	Major	(29.4)47 (23.8)38	

The analysis of postoperative recovery times demonstrated significant differences between groups for both elective ( $3.87 \pm 1.12$  days in COVID-19 positive patients vs  $2.7 \pm 0.98$  days in negative patients,  $p=0.047$ ) and minor procedures ( $4.11 \pm 2.12$  days vs  $3.5 \pm 1.14$  days,  $p=0.031$ ), while major surgeries showed no statistically significant difference in recovery duration ( $12.3 \pm 3.3$  days vs  $11.8 \pm 2.5$  days,  $p=0.051$ ), suggesting that COVID-19 infection may have a more pronounced impact on recovery following less invasive surgical interventions.

**Table 3- Comparison of mean postoperative recovery time by surgery type**

Variable	COVID-19 PCR Test		p value	
	Positive	Negative		
Elective	$3.87 \pm 1.12$	$2.7 \pm 0.98$	0.047	
Surgery Type	Minor	$4.11 \pm 2.12$	$3.5 \pm 1.14$	0.031
	Major	$12.3 \pm 3.3$	$11.8 \pm 2.5$	0.051

The study revealed significantly worse outcomes among COVID-19 positive surgical patients, with the PCR-positive group demonstrating markedly higher mortality rates (18 deaths [11.2%] versus 6 deaths [3.8%] in negative patients,  $p=0.001$ ). Survival analysis showed corresponding differences, with 62 survivors (38.8%) in the exposed group compared to 74 survivors (46.2%) in the non-exposed cohort. These findings highlight the substantial impact of COVID-19 infection on postoperative mortality risk, with infected patients being nearly three times more likely to die following surgery than their non-infected counterparts. The survival disparity between groups underscores the importance of preoperative COVID-19 screening and careful risk-benefit assessment when considering surgical interventions during pandemic conditions.

**Table 4- Comparison of patient outcomes between groups**

Variable	COVID-19 PCR Test		p value
	Positive	Negative	
Death	(11.2)18	(3.8)6	0.001
Survival	(38.8)62	(46.2)74	

## Discussion

The clinical characteristics and outcomes of surgical patients during the COVID-19 pandemic reveal significant challenges and increased risks. Studies indicate that patients with active COVID-19 infection face higher postoperative complications and mortality rates compared to non-infected individuals. A multicenter cohort study reported a 30-day mortality rate of 15.9% in COVID-19-positive surgical patients, with pulmonary complications occurring in 25% of cases.<sup>9</sup> Another study found that the 30-day mortality rate for COVID-19-infected surgical patients was significantly higher (23.8%) than for non-infected patients (1.4%). The incidence of major complications was also elevated, with 25.6% of infected patients experiencing severe outcomes compared to 6.8% of non-infected patients.<sup>10</sup>

Additional research has identified specific risk factors for worse outcomes, including

advanced age, comorbidities such as chronic obstructive pulmonary disease (COPD), and neurosurgical procedures.<sup>11</sup> Consistent with our findings, another study reported higher mortality rates in COVID-19-positive surgical patients, emphasizing the need for rigorous preoperative screening.<sup>12</sup>

Despite these findings, some argue that essential surgeries should not be delayed, provided adequate protective measures and screening protocols are implemented to mitigate risks.<sup>12</sup> In our study, we attempted to track patients who underwent surgery during the COVID-19 incubation period. However, as a retrospective cohort study, our research faced limitations, including the exclusion of cases with unclear disease progression and inaccurate recall of symptom onset dates in critically ill patients. To address these issues, we obtained the most precise clinical information possible from patients' companions.

## Conclusion

The evaluation of clinical characteristics and outcomes in surgical patients during the COVID-19 pandemic is critically important, highlighting the need for specific management strategies to mitigate risks and improve treatment results. Furthermore, adherence to health protocols and the implementation of preoperative diagnostic testing represent effective measures for reducing potential complications.

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