



Evidence-based approach to determine risk of elective surgery during COVID-19 era

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic has been the worst public health catastrophe of our lifetime. It is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 has been associated with nearly 7 million deaths worldwide. Many hospitals and medical centers had to alter their normal practice patterns. Pertaining to surgery, many centers stopped performing elective surgeries at the beginning of the pandemic. There were many difficult decisions that were made related to which types of surgeries were considered elective versus more urgent. The authors of the current study by Kato and colleagues described their experience during the pandemic and their outcomes in patients undergoing pulmonary resection for stage I lung cancers (1). In this editorial, we will review the current study and then give potential guidelines for future events. Unfortunately, there are multiple reasons why we may experience another public health crisis like this in the future.

Discussion

Surgeries during the pandemic period

Based on community levels and transmission rates, cities and local governments enacted lockdown policies for all non-essential businesses. Medical centers responded by stopping elective surgeries and procedures (2,3). Some patients

with stable disease had management deferred for several months (4). Rates of cancer screening diminished significantly (5,6). Surgery teams largely stopped performing elective surgeries for two reasons. Firstly, many centers were overwhelmed with patients who contracted COVID-19 and had no capacity for elective surgery patients. Secondly, there was a fear that elective patients would contract COVID-19 while in the medical center.

The article by Kato and colleagues directly addresses that second concern. The authors divided the study period into 2018–2019 (pre-pandemic period) compared to 2020–2021 (pandemic period). They found that during the pandemic period, there was only one patient out of 443 who developed COVID-19 after surgery. That case occurred five months after surgery. Nevertheless, that number must be considered in context. During the pandemic period, the authors also noted that as COVID-19 community levels increased, the number of surgeries decreased. As such, the authors were modifying their selectivity based on community levels and transmission rates. The institution in this study seemed to modify their selectivity in a rapid manner, as the rate of surgical resections rebounded quickly after a COVID-19 surge. This approach seems quite reasonable going forward. As the levels of COVID-19 fluctuate in the future, it is appropriate to change the selection criteria for patients who will undergo surgery. For example, during a period of high community transmission rates a patient with a small thymoma can probably wait for several weeks until

the community rates diminish. In contrast, a patient with a large malignancy that abuts the hilum or mediastinum may require a more urgent operation even with elevated community rates.

Mitigation strategies

This article, along with others, has shown that patients can undergo elective surgeries during the pandemic period with a very low risk of contracting COVID-19 (7,8). This article discussed some of the mitigation strategies that hospitals developed to reduce transmission risks. Almost all medical centers developed a mandatory facemask policy for all patients, visitors and employees. Physical barriers such as mounted countertop walls were placed throughout hospitals. Families were not allowed to visit their loved ones who were in the hospital. Touch-free thermometers were used to screen everyone who entered the institution. At the institution of the authors, patients were admitted 24 hours preoperatively and were advised to isolate themselves for 14 days before surgery. They also had a nasopharyngeal COVID-19 test done on admission. Future studies should focus on the effectiveness of each of these individual strategies compared to the burden associated with them. For example, restricting families from visiting very likely reduced the risk of employees or postoperative patients contracting COVID-19. But this decreased risk came at the expense of the mental health of most patients who were unable to see their families for days to weeks at a time. This restriction was probably advantageous overall. Perhaps there were some mitigation strategies that were not helpful enough to be repeated in the future, however.

Impact of vaccines and how to treat unvaccinated individuals

It is likely that the most important phenomenon to occur in the last 3 years was the development of a vaccine against COVID-19. The distribution of this vaccine globally led to steep reductions in the number of deaths worldwide. The vaccine also allowed medical centers to begin to function in a manner similar to their pre-pandemic pattern. Japan currently has the fourth highest rate of total vaccinations per capita, at 306.1 vaccinations per 100 people (9). Japan trails only Gibraltar, Cuba and Chile in this category. This very high vaccination rate likely helped Japanese institutions significantly to reduce spread of disease in hospitals and in postoperative patients. In comparison, Singapore has had

261.3 vaccinations per 100 people. The United States has 201.7 vaccinations per 100 people. Tunisia has had 107.2 vaccinations per 100 people. It is important to consider vaccination rates as institutions decide how to select surgeries in the future. Medical centers in locations with a high vaccination rate can probably have a wider selection of patients to offer surgery than medical centers in areas with a high percentage of unvaccinated people. Even within a country, there may be significant variations in the vaccination rate among the community.

Another consideration is whether to use vaccination status to decide whether to operate on individual patients. As mentioned earlier, most studies have reported a low transmission rate in postoperative patients. But most of these studies have not reported on the vaccination status of patients. Even if a preoperative test is obtained for a patient's COVID-19 status, there will still be time in the days before operation for transmission to occur. In addition, patients may be at risk to contract disease in the immediate postoperative period. This transmission may occur from employee to patient or from family visitor to patient. Since COVID-19 testing is not done routinely in employees or families, unvaccinated postoperative patients will be more susceptible to transmission from these sources. Despite this increased risk, we feel that it is reasonable to advise the patient of the risks and encourage vaccination ahead of surgery. There will be some patients who decide to receive a vaccination as a result of this preoperative counseling. For patients who still refuse to get vaccinated, it is justifiable to proceed with surgery as long as each patient understands the risk of transmission postoperatively. Unvaccinated patients may also choose to limit visits from patients and friends postoperatively. Unvaccinated patients can also decide to limit their social engagements postoperatively for the first few weeks after surgery.

Consequences of delaying surgery

Some elective surgeries were postponed or canceled during the pandemic period. It is important to note the consequences of delaying or canceling surgery. In this current study, mortality and postoperative complication rates were similar in both groups. But patients in the pandemic group had larger tumors. In addition, patients in the pandemic group were more likely to be Stage IA3 and IB. It is very likely that the delay in operation was related to the larger tumor size. Future studies with longer follow-ups will be needed to determine whether there was any effect on oncological outcome or survival during

the early pandemic period.

Interestingly, in this study, the authors showed that the percentage of patients who underwent minimally invasive operations increased dramatically. While only 44 percent of patients underwent minimally invasive resections in the pre-pandemic period, 71% of patients had minimally invasive operations in the pandemic period. This increase was mediated by an increase in both robotic and thoracoscopic procedures. There are likely multiple factors responsible for this increase, including surgeon learning curve, operating room availability and other institutional influences. It is important to note that surgical quality was not affected during the pandemic period.

Though not addressed by this study, a certain percentage of patients who would have received surgery never did. Some patients were upstaged during their delay. Other patients with early lung cancer opted for alternatives to surgery such as stereotactic radiation treatment. Other patients developed concomitant illnesses, such as COVID-19, which precluded them from surgery. This loss of surgical patients was not necessarily captured by the current study. Although they did note that the number of patients who received surgery decreased during a COVID-19 wave, the rate of surgery recovered quickly thereafter. It would be helpful for other studies to address the outcomes in patients who were scheduled for surgery but ultimately never received surgery.

Recommendations for future waves

The COVID-19 pandemic has been a public health tragedy not seen in over 100 years. The pandemic affected nearly every aspect of life around the world. Unfortunately, another pandemic may occur in the near future. Recent and ongoing global climate change has been linked to multiple viral outbreaks in the last 20 years. The increased number of outbreaks may be related to increased global temperatures and more time for parasites to thrive (10,11). Zika virus, Ebola virus, swine flu and the Middle East respiratory syndrome coronavirus are all examples of viral outbreaks in the last 20 years that were associated with significant morbidity. It is reasonable to expect another outbreak in the next decade. While it may not be as pervasive or devastating as COVID-19, it will be important for medical centers to be prepared in the future. We recommend the following strategies. Vaccinations should be encouraged in as much of the surrounding community as possible. Although many medical centers did promote the benefits of

vaccines, there is the potential for increased collaboration with community partners and organizations. As multiple studies showed that there were significant disparities in who received vaccinations, improved collaboration may help to increase community vaccination rate. Elective surgeries should be reduced or halted based on community levels and transmission rates. Individual patients should be encouraged to be vaccinated, but there does not appear to be enough evidence to deny surgery based on vaccination status. COVID-19 testing should be done routinely and preoperatively based on community levels.

Conclusions

Although COVID-19 led to the death of nearly 7 million people, institutions were able to perform elective surgeries with low postoperative transmission rates. Another outbreak is likely to occur in our lifetime. Utilizing the lessons we learned during this time will reduce the morbidity from the next pandemic.

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