

ORIGINAL PAPER

Urology

A nationwide survey on the impact of COVID-19 pandemic on minimal invasive surgery in urology practice

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Abstract

Objective: The beta-coronavirus (COVID-19) pandemic has changed the clinical approach of 93% of urologists worldwide, and this situation has affected the use of laparoscopic and robot-assisted laparoscopic methods, which are known as minimally invasive surgery (MIS). This study aimed to determine the effects of the COVID-19 pandemic on MIS in urology practice at national level.

Design, setting and participants: A total of 234 urologists in Turkey participated in an online survey between August 22 and September 23, 2020.

Outcome measurements and statistical analysis: Descriptive statistical analyses were conducted to determine the participants' demographic characteristics and responses to multiple-choice questions.

Results: While 54% of urologists stated that they were concerned about the possibility that the patients planned to undergo MIS were carrying COVID-19 or false-negative for the virus, 51% considered that open surgery was safer than MIS in this regard. The pandemic led to a difference in the preferences of 40% of the urologists in relation to open or MIS methods, and during the pandemic, 39% of the urologists always directed their patients to open surgery. It was determined that during the pandemic, there was a statistical decrease in the intensity and weekly application of MIS methods among all surgical procedures compared to the pre-pandemic ($P < .001$ and $P < .001$, respectively). MIS was preferred for oncological operations by 97.3% of the urologists during the pandemic, with the most performed operation being radical nephrectomy (90.7%). Among oncological operations, radical prostatectomy was most frequently postponed. To prevent virus transmission during MIS, 44% of the urologists reported that they always used an additional evacuation system and 52% took additional precautions. There were a total of 27 healthcare workers who took part in MIS and tested positive for COVID-19 after the operation.

Conclusions: Although the number of operations has decreased during the ongoing pandemic, MIS is a method that can be preferred due to its limited contamination and mortality in urology practice provided that safety measures are taken and guideline recommendations are followed.

1 | INTRODUCTION

The outbreak of the new human beta-coronavirus (COVID-19), called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was first reported in Wuhan, China in December 2019.^{1,2} COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 11, 2020, when the first case in Turkey was reported by the Ministry of National Health.³ As of December 25, 2020, a total of 77 920 564 cases of COVID-19 and 1 731 901 deaths have been confirmed across 188 countries/territories.⁴ As in the whole world, Turkey has undertaken action to adapt the healthcare system to optimise the available resources as one of the countries most affected by the virus since the beginning.⁵ Accordingly, during this process, as in other countries, many hospitals in Turkey have been designated as pandemic hospitals, and all elective operations and daily patient examinations have been limited in line with the sufficiency of resources.⁶ The primary purpose of these measures is to reduce the consumption of resources by intensive care patients and inpatients after major surgery and to minimise the theoretical possibility of viral transmission during such operations in the setting of COVID-19.⁷ The pandemic is reported to have affected the clinical approach of 93% of urologists around the world, and the main reasons for this change include the several potential transmission routes of COVID-19 and the lack of definitive results on this issue in studies conducted.^{1,5} Therefore, recommendations have been made by various sources on the management of this situation, but there are potential concerns as to whether these recommendations are applicable to different populations from different geographical regions of the world influenced by socio-cultural conditions and local administrative regulations.^{3,8} All these concerns and uncertainties have reduced the use of minimally invasive surgery (MIS), namely laparoscopic and robot assisted laparoscopic operations, which were increasingly used in urology practice in the pre-pandemic period in many indications, and accordingly, the training and fellowship of urology resident programs are also negatively affected.^{9,10} In this study, we conducted an online survey to investigate the impact of COVID-19 pandemic on MIS in urological practice in Turkey from a nationwide perspective.

2 | MATERIAL AND METHOD

For this cross-sectional nationwide study, we used the platform www.surveymonkey.com and designed a 25-item online survey to investigate on the nationwide effects of the COVID-19 pandemic on the MIS preferences of urology departments. This survey consisted of multiple-choice items inquiring about the behaviours and concerns of urologists in relation to the MIS preferences in the preoperative period, measures taken to minimise the risk of transmission, changes in the frequency of MIS during the COVID-19 pandemic, and reflection of these measures on the clinic and educational programs during this period. Our study was designed in accordance with the rules of the Checklist of Reporting Results of Internet-E-Surveys

What's known

- Many countries have restricted elective operations in line with the sufficiency of hospital resources during the pandemic.
- The use of minimally invasive surgery reduced due to concerns and uncertainties of surgeons.

What's new

- In this study, the tendency of surgeons to perform safe surgery were discussed during the pandemic.
- Minimally invasive surgery is still a method that can be preferred in major urological centres with limited viral contamination in urology practice during Covid-19 era.

(CHERRIES).¹¹ A total of 446 urology specialists working in training and research or university hospitals in all seven regions in Turkey and included in the mail list (current and past members) of the Turkish Endourology Society, were invited to participate in the study. An invitation e-mail was sent on August 22, 2020, and responses were recorded until September 23, 2020. All participants agreed on the conditions of the survey before completing it. To ensure higher and full participation, the survey was designed in a way that it did not require the participants to respond to all the items. The study was approved by University of Health Sciences Bakirkoy Dr Sadi Konuk Research and Training Hospital (Reference No: 2020/333).

2.1 | Statistical analysis

A descriptive statistical analysis was performed to determine the demographic characteristics and the responses given to the multiple-choice items. The age of the participants was given as mean and standard deviation while the remaining descriptive data were reported as frequencies and percentages. The participants' responses to multiple-choice items were illustrated using bar and pie charts. In some multiple-choice items, the participants were asked to provide numerical values in addition to marking the answer. These data were displayed on a graph. The Shapiro-Wilk test was used to determine the consistency of continuous data to normal distribution. The McNemar test was conducted to compare categorical data before and after the pandemic while the Wilcoxon test was undertaken to compare continuous data that were not normally distributed. Statistical significance was considered when the *P* value was < .05. Statistical analyses were performed using IBM SPSS Statistics, version 20 (Armonk, NY: IBM Corp.).

3 | RESULTS

A total of 234 urologists working in tertiary hospitals (training and research or university hospitals) located in seven different

regions of Turkey completed the survey. The mean age of the participants was 43.2 ± 5.6 years. Of the participants, 38.9% ($n = 91$) worked in university hospitals and 61.1% ($n = 143$) in training and research hospitals. In terms of the geographical distribution, the highest proportion of respondents was based in the Marmara region. The demographic details are summarised in Table 1.

TABLE 1 Demographic characteristics of the responders, COVID-19 diagnostic tests, and hospital status during the pandemic

	n
Number of responders, n	234
Mean age $\pm$ SD	43.2 ± 5.6
Hospital type, n (%)	
University hospitals	91(38.9)
Research and training hospitals	143 (61.1)
Regional distribution of responders, n (%)	
Marmara	74 (31.6)
Central Anatolia	38 (16.2)
Black Sea	34 (14.5)
Mediterranean	24 (10.3)
Eastern Anatolia	23 (9.8)
Southeastern Anatolia	21 (9.0)
Aegean	20 (8.5)
Has your hospital been designated as a pandemic hospital? n (%)	
Yes	202 (86.3)
Partially	23 (9.7)
Never	9 (3.8)
Number of urologists taking active part in patient care during the pandemic, n (%)	194 (96.0)

3.1 | Urologists' concerns about MIS during the COVID-19 period

While 54% of urologists stated that they were concerned about the possibility that the patients planned to undergo MIS were carrying COVID-19 or false negative for the virus, 42% stated that they did not experience any such concern. In terms of COVID-19 transmission, 51% of the participants stated that open surgery was safer than MIS while 22% considered that it was not safer and 27% were undecided. The pandemic was found to have led to a difference in the choice of open or MIS methods among 40% of the urologists while it did not affect the decision of 42% of the urologists. As a reflection of this situation on clinical practice, it was observed that 39% of the urologists always directed their patients to open surgery, 35% sometimes, and 26% never (Figure 1).

3.2 | Effect of the pandemic on the urologists' preferences regarding MIS

There was a statistically significant decrease in the frequency of MIS methods among all surgical procedures during the pandemic compared to the pre-pandemic period ($P < .001$). The mean number of MIS methods applied per week in one hospital was 3.10 before the pandemic and determined to have decreased to 1.08 during the pandemic ($P < .001$). During the COVID-19 pandemic, 97.3% of the urologists preferred MIS for oncological operations, 6.7% for urinary stone disease, 5.8% for reconstructive surgery, and 3.6% for paediatric surgery. Among the oncological operations, the most preferred for MIS was radical nephrectomy (90.7%), followed by partial nephrectomy (55.6%), nephroureterectomy (55.1%), and radical prostatectomy (49.1%). However, it was also determined that concerning the indications of oncological operations, 40.5% of the urologists only recommended surgery for emergency cases, 33.8%

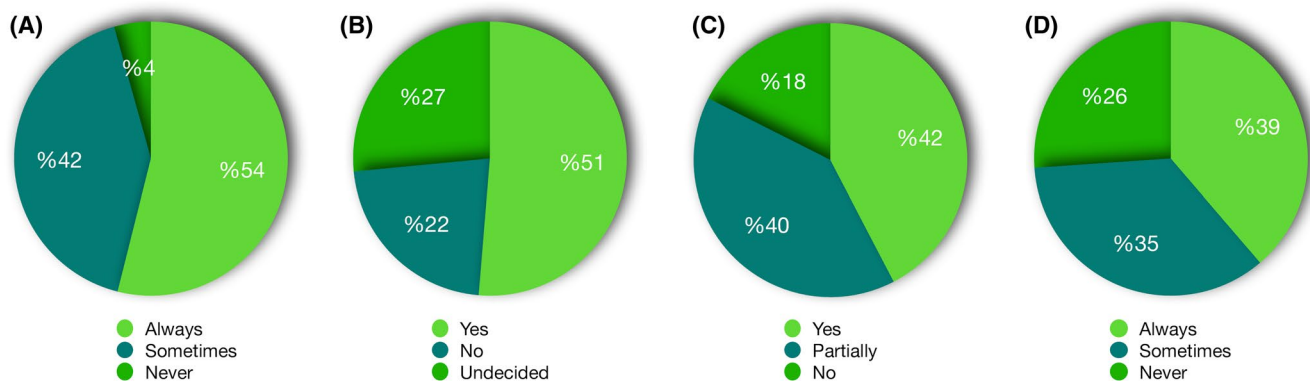


FIGURE 1 A, Do you have concerns about the possibility of your patient carrying COVID-19 or being false-negative for the virus? B, Is open surgery safer than laparoscopic/robotic surgery in terms of COVID-19 transmission? C, Has the pandemic caused a difference in your choice of open or laparoscopic/robotic surgery in patients scheduled for surgery? D, Have you directed your patients to open surgery in cases where you would normally use laparoscopic or robotic methods?

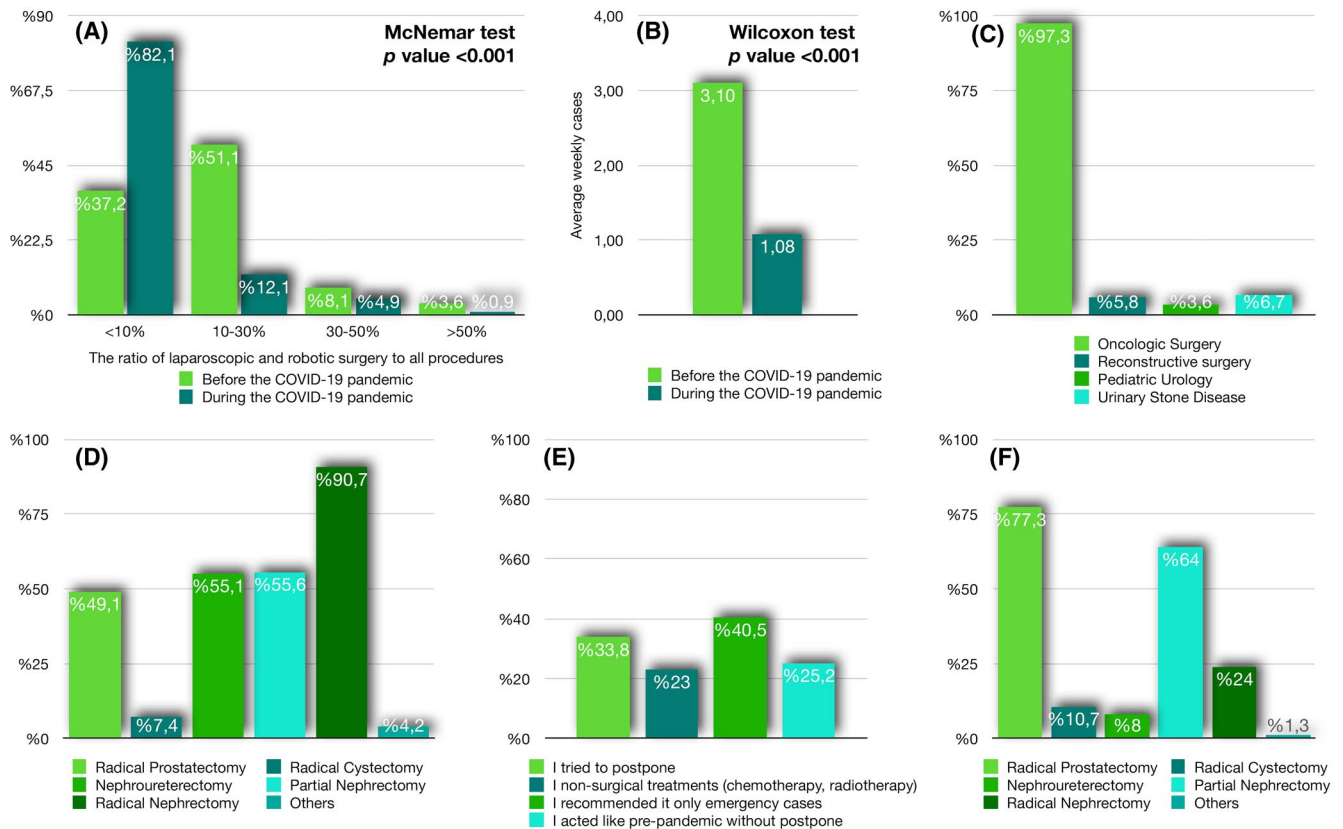


FIGURE 2 A, What was the share of laparoscopy and robotic surgery in all surgical procedures in your clinic before and during the pandemic? B, How many laparoscopy or robotic surgery operations per week did you perform or participate in before the pandemic and how many during the pandemic? C, Which operations do you prefer to use laparoscopy or robotic methods in your clinic during the pandemic? D, For which oncological operations do you mostly prefer laparoscopy or robotic methods in your clinic? E, What is your behaviour in relation to operation indications of oncological patients during the pandemic? F, If you have postponed any surgery during the pandemic, which oncological operations have you postponed more?

postponed operations, 23% recommended non-surgical treatments, and only 25.2% continued to behave similar to the pre-pandemic period. Among oncological operations, the most frequently postponed were radical prostatectomy (77.3%) and partial nephrectomy (64%) (Figure 2).

3.3 | Protective measures adopted by the urologists during the pandemic

As a pre-operative method of protection, 88.7% applied real time-polymerase chain reaction (PCR), 32.1% thorax computed tomography (CT), and 65.2% temperature screening while 2.1% applied all these tests and 8.2% none. During the operation, 38% of the urologists always used protective equipment in addition to surgical masks (overalls, goggles, face shield, etc), 38% sometimes, and 24% never. In terms of intraabdominal gas drainage while performing MIS, 44% of the urologists stated that they always used an ultra-filtration system or an improved closed-circuit evacuation system, 16% sometimes, and 40% never. When asked about the frequency of using measures such as working with low pressure or reducing the use of electrocautery time in order to reduce the possibility of virus

transmission through the smoke created by electrocautery during MIS, 52% of the urologists responded always, 26% sometimes, and 22% never (Figure 3).

3.4 | Personal implications of the COVID-19 pandemic for urologists and patients

Finally, in this survey, it was aimed to determine how much the urologists were affected by the COVID-19 pandemic in clinical practice despite the measures taken and modified surgical behaviour. When asked about the patients who were operated on despite the positive COVID-19 test during the pandemic, it was reported that the only five (2.2%) of the urologists operated on positive patients, and the total number of operated patients was nine. Concerning mortality among the positive patients who underwent surgery, four respondents that had operated on positive patients gave the answer "no", with only one participant responding "yes", stating that two of his/her patients had died of COVID-19. Thirty-two urologists encountered patients who had been operated with a negative preoperative test but had a positive test in the early postoperative period while the remaining 189 urologists reported no such patient. It was

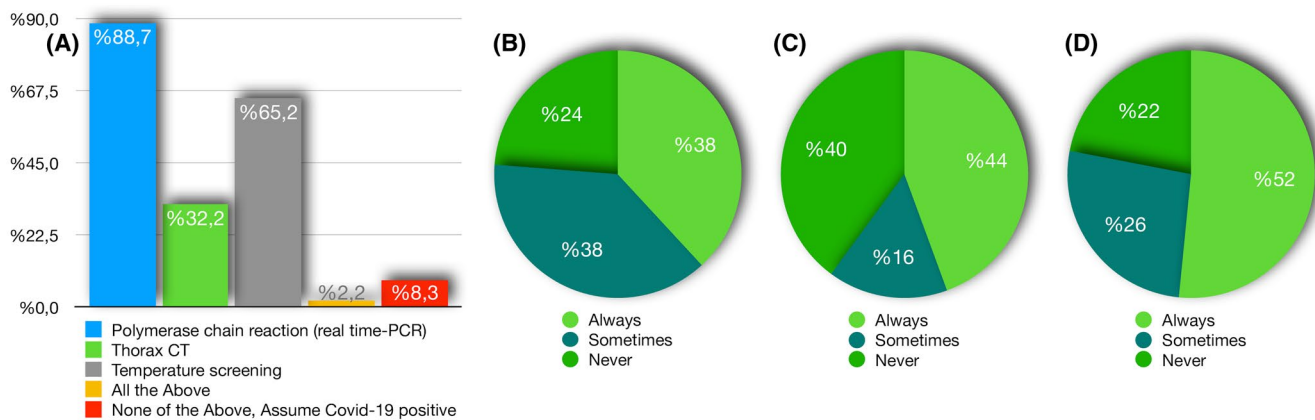


FIGURE 3 A, Which COVID-19 diagnostic test do you use on your patients before the operation? B, Do you use personal protective equipment other than masks throughout the operation during the pandemic? C, Have you used an ultrafiltration system or an improved closed-circuit evacuation system for the evacuation of intraabdominal gas during the pandemic? D, Do you apply additional methods (working with low pressure, reducing electrocautery use time, etc) to minimise virus transmission during or after the operation?

reported that the process resulted in mortality in only one of these patients. There were a total of 27 healthcare workers that tested positive for COVID-19 after taking part in MIS as surgical team members of 12.2% of the urologists. Considering that our survey only targeted urologists working in tertiary hospitals, 64.3% of the participants thought that their urology residents' MIS training was completely disrupted, 31.7% partially disrupted, and 4% not disrupted at all (Figure 4).

4 | DISCUSSION

This nationwide survey and analysis study conducted by the Turkish Endourology Society provides a glimpse of how the minimally invasive robotic and laparoscopic methods in the field of urology have recently been affected at national level as the COVID-19 pandemic continues to spread globally and is entering its second wave all over the world. There are only a limited number of studies that convey the clinical and surgical experiences of urologists during the pandemic. The extent to which urology practice has been affected shows differences across the world depending on the decisions taken by the federal government of each country and their available resources.¹ Our survey study constitutes the most comprehensive work at national level, including urologists working in tertiary hospitals from all regions of Turkey.

In Turkey, following the recommendations of the Ministry of National Health, hospitals have radically changed their working patterns in order to adequately attend to the healthcare needs for the increasing number of COVID-19 patients.⁶ In addition to these changes, guidelines classify operations according to their priority and recommend postponing low-priority surgery; however, urologists are still concerned about viral transmission.⁷ In our study, it was determined that 54% of the urologists always, 42% sometimes worried about their MIS patients carrying SARS-CoV-2 or having false negativity for the virus, and only 4% were never worried. According

to a recent analysis, 47% of urologists had fear of going to work and felt very uncomfortable.¹² However, despite these concerns, in the current study, about half of the urologists found laparoscopic or robotic methods to be safer than open procedures. As a reflection of this situation on clinical practice, we determined that while only 39% of the participants always directed their patients to open surgery, the remaining participants either sometimes or always preferred MIS methods. The possibility of faster recovery and less blood loss associated with MIS methods shortens the hospitalisation period of the patients, which can reduce the risk of COVID-19 transmission in the postoperative period.^{13,14} In addition, due to the self-limiting and closed nature of MIS methods, the operation team has less contact with fluid or tissue and can ensure that they worked spaced apart in the operating room.¹³ Despite the advantages and disadvantages of MIS for urological pathologies, it should be kept in mind that there are differences in the use of open surgery or MIS for different pathologies in other branches. While the laparoscopic approach is recommended for peritonitis, hot gallbladder, and acute appendicitis in general surgery, open surgery is recommended for large bowel perforations.^{15,16} Of the urologists in our study, 51.1% stated that they preferred MIS for 10%-30% of all surgical procedures in the pre-pandemic period while 82.1% preferred MIS for less than <10% of operations during the pandemic. In addition, before the pandemic, the number of MIS methods applied per week was 3.1 while it decreased to 1.08 during the pandemic. In single clinical-based experiences reported, it is stated that MIS methods are significantly decreased in the pandemic.³ In our study, we observed that 97.3% of the urologists preferred MIS methods for oncologic operations. In a global survey study of Dotzauer et al, it was determined that non-oncology procedures had higher cancellation rates.⁵ However, it is recommended that oncological procedures that can be postponed should be postponed in order to reduce viral transmission and occupy less intensive care beds and ventilators, and to guide this decision, oncological tumours are classified in terms of priority.^{5,17} These recommendations in urology are also valid for colorectal surgery.

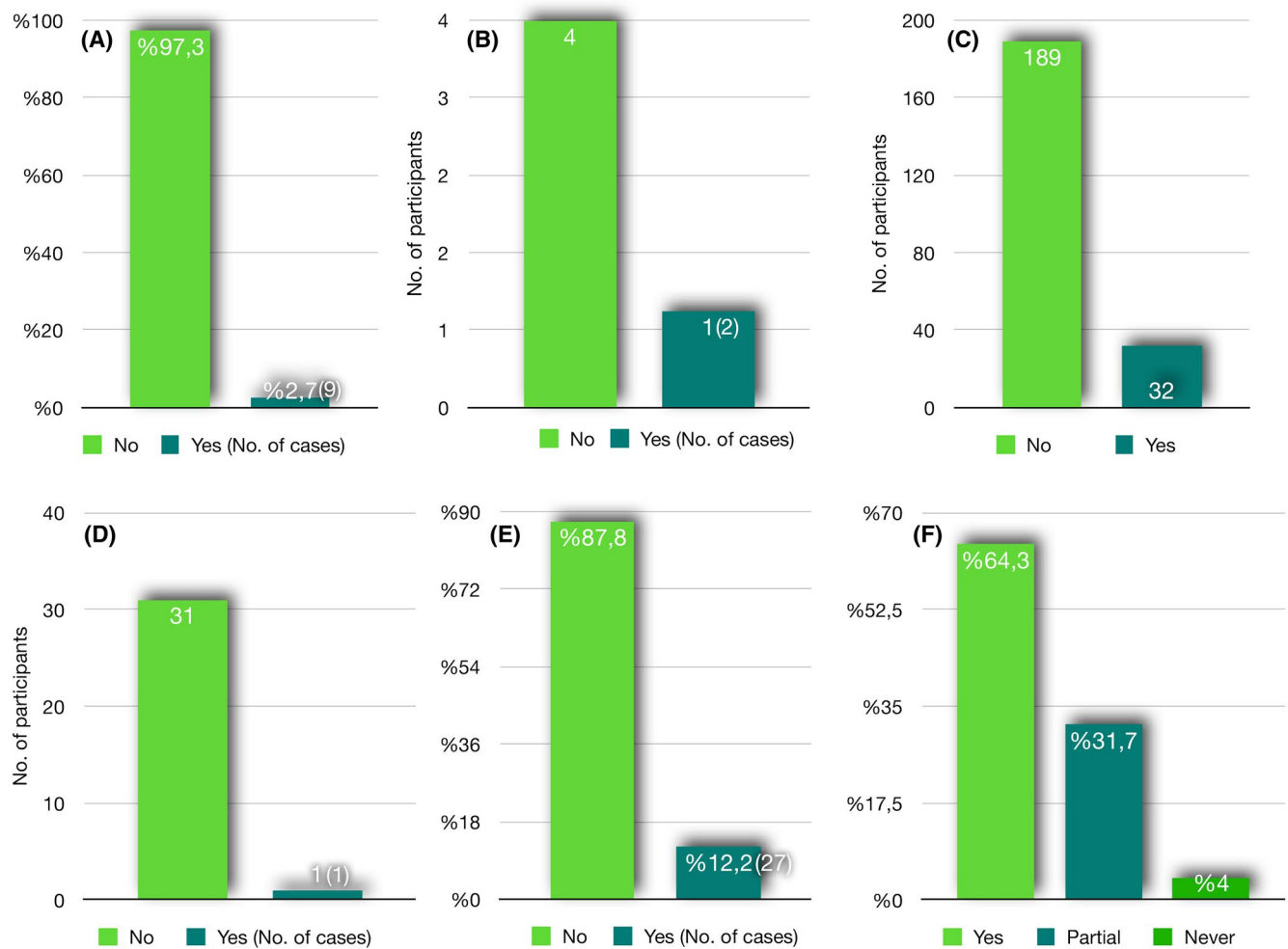


FIGURE 4 A, Have you operated on a patient with a positive COVID-19 test using laparoscopic or robotic methods? B, Has mortality occurred in any of your patients with a positive COVID-19 test after laparoscopy or robotic surgery? C, Have you ever had a patient tested positive for COVID-19 in the early postoperative period? D, Has any of these patients died due to COVID-19? E, Is there any healthcare worker in your surgical team that tested positive for COVID-19? F, Do you think that the laparoscopy/robotic surgery training of urology residents has been disrupted during the pandemic?

Therefore, surgeons in other branches may consider these comprehensive recommendations when evaluating their patients.¹⁸ In our study, 33.8% of the participants stated that they postponed oncological operations, 40.5% stated that they only performed surgery for emergency cases, and 23% recommended non-surgical treatments for their patients. Radical prostatectomy and partial nephrectomy were the most postponed operations. Stensland et al reported that radical prostatectomy and cT1, cT2 kidney cancer treatment should be postponed during the pandemic.¹⁷ Nevertheless, in cancer patients for whom non-surgical neo (adjuvant)/palliative treatment options are considered, the progression of the disease due to COVID-19 transmission or delayed treatment are among the risks that should be taken into consideration.⁵

In cases where non-deferrable surgery and MIS are planned, the patient should be screened for general health, regardless of preoperative symptomatic status.¹⁹ In our study, as preoperative testing, 88.7% of the participants stated that they applied PCR, 65.2% temperature screening, and 32.1% thorax CT, and only 2.1%

applied all these methods. Surgeons should be careful that these available tests have various limitations. It has been found that the sensitivity of nasopharyngeal and oropharyngeal PCR tests is 60%-70%, and that of serologic tests is higher (80%-100%).²⁰ The Royal College of Surgeons recommends thorax CT, which has high sensitivity in preoperative testing, especially in patients with respiratory symptoms.^{20,21} Considering the possibility of false negativity, extensive testing is considered to be the safest and most effective strategy.¹⁴ Despite the routine use of preoperative tests, all patients should be considered to be potentially infected during the pandemic.²⁰ In patients with COVID-19 positive that require urgent surgery, 44% of surgeons state that they would continue to perform emergency surgical procedures after taking necessary preventive measures, and 26% of surgeons would perform emergency laparoscopic surgery on these patients.^{22,23} Urologists have various concerns about the potential risk of viral transmission due to SARS-CoV-2-contaminated aerosol generated by energy sources during the operation.⁹ In previous studies, *Corynebacterium*,

papillomavirus, and human immunodeficiency virus were detected in surgical smoke, but there is no evidence that COVID-19 infection is transmitted in the same way.²⁴ Currently, the possibility of SARS-CoV-2 to be found in the abdomen is unknown, and the only proven transmission route is respiratory droplets.^{13,21} CO₂ plume occurs with the use of similar devices in open surgery, and the possibility of viral transmission is not different from laparoscopy.¹³ However, it is stated that SARS-CoV-2 RNA is detected in 5.74% of urine samples and 65.8% of faecal samples in addition to respiratory droplets. Therefore, in operations where the urinary tract or intestinal tract is opened, the possibility of contamination via urine or faeces should also be considered.²⁵

The American College of Surgeons also states that there is not yet sufficient evidence to recommend open surgery against laparoscopy, but MIS may be more beneficial in patients with suspected COVID-19 in the presence of various measures.¹³ The Royal College of Surgeons recommends the use of personnel protective equipment (PPE) and N-95 masks during the operation for protection against potential virus aerosolisation and droplets accumulation.^{14,20} The rate of appropriate use of PPE at all times is reported to be 62.6% in Europe.¹⁰ In our study, we determined that 76% of the urologists almost always used PPE in addition to masks. In addition to the use of PPE, in order to reduce the possibility of viral transmission to the operation team, electrocautery settings should be arranged to reduce the risk of virus release into the CO₂ plume that occurs during MIS, its duration of use should be minimised, use of devices such as ultrasonic scalpel should be avoided, and intraperitoneal pressure should be maintained as low as possible.^{19,24} In our survey, 52% of the participants stated that they always took these measures while 26% sometimes applied them during MIS. However, the use of PPE to prevent viral transmission may cause communication and visualisation problems between surgeons. It may also result in reduced overall comfort and increased fatigue during surgical procedures.²⁶

The aerodynamic size of SARS-CoV-2 is 0.06 to 0.14 µm. During the operation, smoke ultrafiltration systems and closed-circuit evacuation systems have the ability to filter SARS-CoV-2 particles.^{19,21} For this reason, it is recommended to use closed filtration systems, closed insufflation systems, and filtered suction devices during MIS during the pandemic.²¹ In our study, it was determined that 44% of the urologists always used an additional system to reduce CO₂ release during MIS.

Although there are various precautions described above, COVID-19 positivity can be seen in healthcare workers. In our study, 12.2% of the participants stated that a total of 27 healthcare workers in the surgical team developed positivity. However, fatality among healthcare workers due to MIS has not yet been proven,²¹ and we do not know whether this situation occurred due to viral transmission during MIS for the healthcare workers mentioned by the urologists in our study. The surgery of COVID-19-positive patients should be postponed unless it is urgent.¹⁹ In a European-based study, it was found that 8.4% of patients diagnosed with COVID-19 were operated with elective indications.¹⁰ In our study, we determined that 2.2% of the participants operated on a total of nine COVID-19

positive patients with MIS and observed mortality in two of these patients. However, we do not have information about the comorbidities and general conditions of the cases that resulted in mortality. Despite preoperative tests, COVID-19 positivity, which is diagnosed through the deterioration of the general condition of the patients in the early postoperative period or based on different findings, constitutes a potential risk. In our study, it was determined that 14% of the urologists encountered this situation, and one patient died.

Finally, since our survey covered only urologists working in tertiary hospitals, we also questioned whether the training of residents in their clinics was affected during the pandemic. Of the participants, 64.3% stated that the MIS trainings of their residents were disrupted, 31.7% partially disrupted and 4% not disrupted at all during the pandemic. Amparore et al found that clinical/surgical training of >40% of residents decreased drastically while that of >80% was completely suppressed. Consistent with our study, 72.9% of the participants believed that the pandemic would have a negative impact on training activities.²⁷ Although residents experienced difficulties in their surgical training, they considered that their theoretical training would continue at a high quality with the emergence of online training during the pandemic. Urology residents though that webinars, podcasts and other online training portals were very useful in this regard.²⁸

Our study had certain limitations. First, the duration of our online survey was a month. Therefore, the information we presented above cannot be generalised to the entire pandemic period. In addition, we had to rely on self-reported information due to the survey methodology. Cancers that should be postponed are classified in the guidelines according to clinical stage, but we did not go into details of this classification in order to use the number of questions sparingly in our study.

5 | CONCLUSION

Our study shows that although the number of operations has decreased in line with the measures taken and the recommendations of the guidelines, MIS is still a method that can be preferred for major urological centres with limited contamination and mortality in urology practice during the pandemic. We obtained the data from urology specialists working in major reference centres to which non-deferrable cases are referred in Turkey. Our survey reveals the significant regional variations and practices relating to the impact of the COVID-19 pandemic on the robotic and laparoscopic methods frequently used in urology practice in Turkey. After the first wave, it is not yet known how long the second wave of the pandemic will last and the severity of other waves that will be experienced across the world. Although the information provided in our study varies according to regional facilities and conditions, it can shed light into clinicians' behaviour in the coming days since it was conducted at national level with broad participation. However, global data obtained from multi-centre prospective clinical and epidemiological studies are needed to provide more definitive information.

DISCLOSURES

The authors declare that they have no conflict of interest.

ETHICAL STANDARDS

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

INFORMED CONSENT

Informed consent was obtained from all participants who completed the survey.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

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