

The effect of the COVID-19 pandemic on anesthesia techniques in tertiary hospital: general anesthesia or regional anesthesia – a retrospective cohort study

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Abstract. – OBJECTIVE: We aimed to find out how the pandemic process changed the anesthesia methods applied in Çorum Single Tertiary Region Hospital. In our hospital, we investigated the anesthesia methods used for surgical procedures before and during the pandemic, the number of cases, and the impact of the pandemic on emergency and elective surgeries.

MATERIALS AND METHODS: This is a retrospective cohort study comparing COVID-19 pandemic's effect on the number of surgical operations and anesthesia techniques. The 22-month surgeries during the pandemic period and the 22-month pre-pandemic surgeries were compared in terms of anesthesia methods, branch-specific, and overall case changes. The data obtained were analyzed comparatively in terms of anesthetic techniques, branch-specific and overall case changes of the patients operated on in the operating room before and during the pandemic.

RESULTS: While 65,984 surgical procedures were performed in the pre-pandemic period, only 54,352 were performed during the COVID-19 pandemic. The total number of surgical procedures decreased by 17.63% during the pandemic. While there was a 21.1% decrease in elective surgeries due to the pandemic, there was a 71.43% increase in emergency surgeries during the pandemic period. There was a significant disparity in the distribution of both elective and emergency cases by surgical specialty. It was found that the surgical specialties that received the most cases during the pandemic were General Surgery, Obstetrics-Gynecologic Surgery, Urologic Surgery and Orthopedic Surgery. During the COVID-19 pandemic, regional anesthesia (RA) was used in 16.95% of cases (as the primary technique). The use of RA as the primary anesthetic technique was significantly higher (10.61%) than in the pre-pandemic data. It was observed that specialties such as General Surgery, Obstetrics-Gynecologic Surgery, Urologic Surgery, And Orthopedic Surgery were prominent in the distribution of regional anesthesia.

CONCLUSIONS: The COVID-19 pandemic was not the first and will not be the last and during this period we saw how important the personnel

and material management are. Our study plays an important role in showing the uneven distribution of expected surgical procedures in operating rooms during the pandemic situation. It may provide guidance on the distribution of limited and essential personnel and personal protective equipment (PPE, medications, etc.) during the pandemic period. In this context, regional anesthesia may play an important role in the future because it can provide high-quality perioperative care to patients while minimizing the preference for general anesthesia during surgical procedures, thus minimizing personnel burden and limited resource use.

Key Words:

COVID-19 pandemic, Anesthesia management, General anesthesia, Regional anesthesia.

Introduction

A pandemic is the general term for epidemic diseases that spread over a large area in more than one country or continent in the world. The Coronavirus disease 19 (COVID-19) virus emerged in the city of Wuhan, China, on November 17, 2019, and has spread worldwide. The first COVID-19 case in our country was detected on March 11, 2020¹. The World Health Organization (WHO) declared COVID-19 disease as “pandemic” on April 10, 2020². As of 19:26 on October 10, 2022, when the survey data were collected, there were 618,521,620 confirmed cases of COVID-19, including 6,534,725 deaths reported by the WHO. In the early days, the preparation of hospitals to receive COVID-19 patients and the lack of an effective treatment method caused considerable confusion and anxiety among health professionals³. Both patients and healthcare workers avoided reporting to the hospital for fear of contracting the virus there⁴.

In our country, serious measures have been taken by the Ministry of Health in accordance with the recommendations of the WHO. As part of these measures, it was decided to stop elective case-control surgeries in hospitals and to treat only births, cancer, and emergencies. While continuing the treatment of births, emergency surgeries and cancer patients, plans were made for the efficient use of personnel and existing hospital capacity. High-risk aerosol generating procedures (AGP), such as tracheal intubation, were reduced to protect anesthesiologists and care team from the risk of infection. Effective use of limited personal protective equipment and ICU bed capacity was ensured^{5,6}.

The problem that most strained hospital capacities encountered was the need for intensive care and ventilators for COVID-19 patients. Intensive care bed capacity was important for both COVID-19 patients and priority emergency patients⁷⁻¹⁰.

RA offers many advantages in diseases that primarily affect the respiratory system such as COVID-19 which also causes multisystemic problems. When RA is used instead of general anesthesia (GA) in these patients, better quality and long-term postoperative analgesia are observed, as well as a reduction in the risk of perioperative respiratory complications¹¹⁻¹³. GA should be avoided in patients positive for COVID-19 who require surgery, particularly during the pandemic. Additionally, the possibility of medical personnel exposure to AGP increases further with GA use. Regional anesthesia can reduce this risk and reduce the need for FFP3 mask use¹². Our hospital is the only hospital in the region that provides tertiary care. Therefore, it serves COVID-19 patients as well as the entire population, including patients with trauma. It was inevitable that there would be changes in hospital use due to both the actions taken by governments and the fears of the population. The objective of this study is to investigate the anesthesia techniques used in surgical procedures before and during the pandemic in our region, the distribution of caseloads by department, and the impact of the pandemic on emergency/elective procedures.

Materials and Methods

Anesthesia records of cases operated in the operating room of Hitit University Erol Olçok Training and Research Hospital between 2018 and 2022, with the approval of the Ethics Com-

mittee of Hitit University Faculty of Medicine, were reviewed retrospectively (Hitit University of Medicine Faculty Clinical Ethics Committee No.: 2021-73; Clinical trials identifier number: NCT05531006).

The number of cases operated in the operating room before COVID-19 in the 22 months before March 11, 2020, when the first case occurred in our country, and the anesthetic management applied to the cases were compared with the number of cases operated within the 22 months from March 12, 2020, and the anesthetic method. Digital and written sources were scanned in our study. Data from 145,640 surgeries were analyzed. Because 25,304 of these cases were performed outside the operating room, they were excluded from the study. Data from 120,336 surgeries were included in the study. The data obtained were comparatively analyzed in terms of anesthetic techniques, branch-based, and total case changes of the cases operated in the operating room before and during the pandemic.

Statistical Analysis

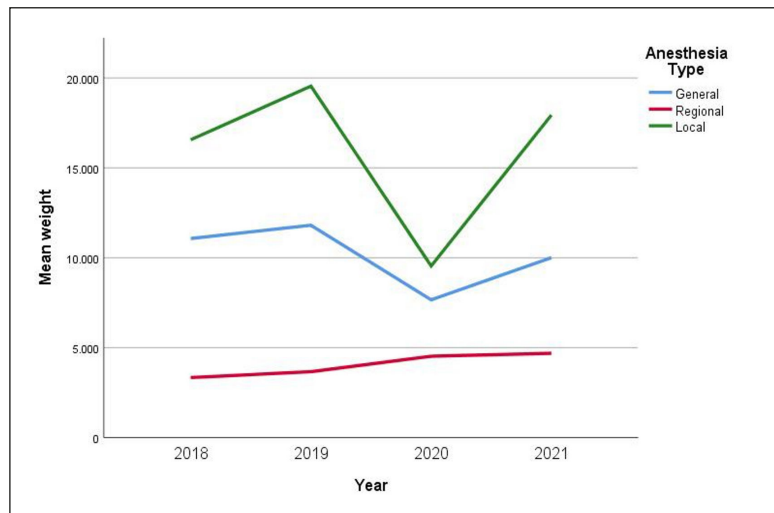
Statistical analysis was performed using SPSS v. 24.0 software (IBM Corp., Armonk, NY, USA). Continuous data were expressed in mean, standard deviation, while categorical data were expressed in numbers and percent. Categorical data were expressed as percentage and absolute rates were compared using Chi-square test, as appropriate. Results were considered statistically significant where $p < 0.05$. All calculations were made with standard commercial software. The Chi-square test was used to analyze the qualitative independent data.

Results

From the beginning of the pandemic in our country, when the data were scanned for the periods of March 11, 2020, 22 months before the pandemic, and 22 months during the pandemic, the data of a total of 145,640 cases were reached. The number of patients admitted to the operating room, which was accepted as the population for the study, was 120,336.

When all surgeries performed in the operating room were examined, it was found that 33.7% used general anesthesia, 13.5% used regional anesthesia, and 52.8% used local anesthesia (LA). When the distribution of all surgeries by anesthesia methods was evaluated by year, it was found that since

Figure 1. Graphical distribution of anesthesia management practices by year (the beginning of the pandemic in our country, March 2020).



2020, when the pandemic was declared, there was a decrease in GA and local applications, while RA applications increased (Figure 1-2, Table I).

Although the total number of surgeries decreased significantly during the pandemic period, a significant increase in regional anesthesia rates was noted, and this increase was statistically significant ($p < 0.05$). During the 22-month pandemic period, the number of RA applications increased by 20.8%. It was noted that GA and LA administration decreased significantly after the pandemic. While this decrease continued with the pandemic, it was observed that GA and LA procedures in-

creased with the increase in caseload but did not reach pre-pandemic levels. RA applications were observed to continue to increase after the pandemic (Table II).

Pre-pandemic use of regional anesthesia accounted for 10.6% of total cases, whereas total cases during the pandemic accounted for 16.9%. When we compared the pre-pandemic and pandemic periods, it was observed that GA decreased by 22.7% and LA applications decreased by 23.9% (Table I). A significant correlation was found between RA and the choice of anesthesia method during the pandemic ($p < 0.05$).

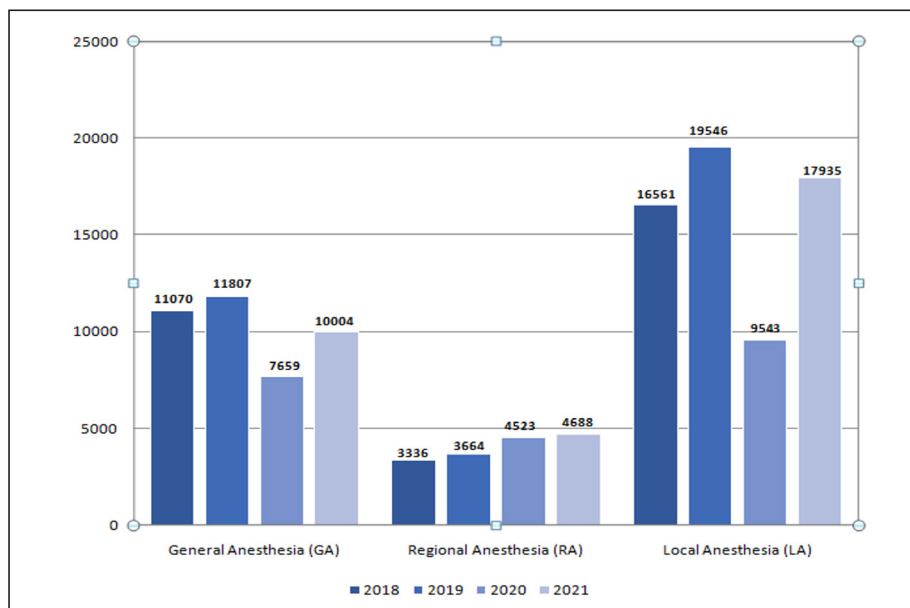


Figure 2. Bar chart of the number of applications of the same anesthesia methods by year (the beginning of the pandemic in our country, March 2020).

Table I. Pre-pandemic and post-pandemic values of anesthesia methods.

Anesthesia Type:	Pre-pandemic	Post-pandemic
General anesthesia (n/%)	22,877 (34.6%)	17,663 (32.5%)
Regional Anesthesia (n/%)	7,000 (10.6%)	9,211 (16.9%)
Local (n/%)	36,107 (54.7%)	27,478 (50.5%)

Table II. Pre-pandemic and postpandemic values of emergency and elective operations.

	Pre-pandemic	Post-pandemic
Elective surgery (n/%)	63,506 (96.24%)	50,104 (92.18%)
Emergency surgery (n/%)	2,478 (3.76%)	4,248 (7.82%)

When we evaluated the cases before and during the pandemic as elective and emergency cases, it was found that the rate of decrease was 21.1% in elective cases and 41.6% in emergency cases. Moreover, a significant correlation was found between the pandemic period and the decrease in elective cases ($p<0.05$). Additionally, a significant correlation was found between the pandemic period and the increase in emergency cases ($p<0.05$).

According to the overall evaluation of cases, regardless of the surgical department or anesthesia method used, the number of cases decreased during the pandemic period, except in Neurosurgery, Orthopedic Surgery, and Otolaryngology (Ear-Nose-Throat). Plastic and Reconstructive Surgery was the surgical department most affected by the decrease in operations (Table III).

A significant correlation was found between the anesthesia method preferences during the

pandemic period in the Departments of Cardiovascular surgery (CVS) and Thoracic Surgery and Neurosurgery (Table IV). GA preference was significantly higher for surgeries performed during the pandemic period ($p<0.05$).

There was a significant correlation between the preference for anesthesia techniques during the pandemic period in General surgery, Obstetric-gynecologic surgery, Orthopedic surgery, and Urologic surgery departments. In these departments, RA preference was significantly higher in patients operated during the pandemic ($p<0.05$).

Since RA is not used in the departments of Ophthalmic surgery and ENT in our hospital, the method of anesthesia was not evaluated. However, it was found that the number of surgeries in these two departments in the operating room was significantly affected by the pandemic.

In the Pediatric surgery and Plastic-Reconstructive surgery departments, no significant

Table III. Pre-pandemic and post-pandemic operation values according to the surgical department.

Department	Pre-pandemic	Post-pandemic
Cardiovascular Surgery (CVS) (n/%)	4,111 (6.23%)	2,590 (4.77%)
Thoracic Surgery (n/%)	764 (1.16%)	499 (0.92%)
General Surgery (n/%)	10,984 (16.65%)	9,160 (16.85%)
Gynecologic Surgery (n/%)	2,172 (3.29%)	1,948 (3.58%)
Neurosurgery (n/%)	2,455 (3.72%)	2,932 (5.39%)
Obstetric and Gynecology Surgery (n/%)	7,073 (10.72%)	5,943 (10.93%)
Ophthalmology (n/%)	4,640 (7.03%)	3,671 (6.75%)
Orthopedics (n/%)	6,475 (9.81%)	6,694 (12.34%)
Otorhinolaryngology (n/%)	3,407 (5.16%)	5,952 (10.95%)
Pediatric Surgery (n/%)	4,204 (6.37%)	2,831 (5.21%)
Plastic and Reconstructive Surgery (n/%)	15,634 (23.69%)	8,534 (15.7%)
Urology (n/%)	4,065 (6.16%)	3,598 (6.62%)

Table IV. Comparative analysis of anesthesia selection during pre- and post-pandemic periods (Chi-square testing).

Department	Number of operations	Anesthesia	Pre-pandemic	Post-pandemic	Statistical Significance p
CVS and Thoracic Surgery	1,913 (3.37%)	General	712 (68.13%)	678 (78.11%)	<0.001
		Regional	333 (31.87%)	190 (21.89%)	
General Surgery	13,164 (23.20%)	General	5,288 (73.2%)	4,118 (69.33%)	<0.001
		Regional	1,936 (26.8%)	1,822 (30.67%)	
Neurosurgery	2,341 (4.13%)	General	925 (71.32%)	844 (80.84%)	<0.001
		Regional	372 (28.68%)	200 (19.16%)	
Obstetric Surgery	13,085 (23.06%)	General	5,118 (93.48%)	5,037 (66.19%)	<0.001
		Regional	357 (6.52%)	2,573 (33.81%)	
Ophthalmologic Surgery	1,321 (2.33%)	General	1,139 (100%)	182 (100%)	*
		Regional	0 (0.00%)	0 (0.00%)	
Orthopedic Surgery	10,699 (18.85%)	General	2,334 (44.97%)	2,116 (38.41%)	<0.001
		Regional	2,856 (55.03%)	3,393 (61.59%)	
Otorhinolaryngologic Surgery	2,393 (4.22%)	General	1,454 (100%)	939 (100%)	*
		Regional	0 (0.00%)	0 (0.00%)	
Pediatric Surgery	5,247 (9.25%)	General	3,236 (99.23%)	1,969 (99.14%)	0.725
		Regional	25 (0.77%)	17 (0.86%)	
Plastic and Reconstructive Surgery	1,238 (2.18%)	General	790 (88.27%)	293 (85.42%)	0.176
		Regional	105 (11.73%)	50 (14.58%)	
Urologic Surgery	5,350 (9.43%)	General	1,881 (64.93%)	1,487 (60.62%)	0.001
		Regional	1,016 (35.07%)	966 (39.38%)	

*Regional anesthesia is not applied in these branches.

correlation was found between the pandemic and the preferred method of anesthesia ($p>0.05$). Although the number of patients was affected by the pandemic, the preferred method of anesthesia did not change in patients who underwent surgery.

Discussion

Health systems around the world have faced numerous challenges as a result of COVID-19. There have been significant changes in medical practices due to COVID-19 and the risks it poses to both patients and healthcare professionals. COVID-19 is highly contagious (basic reproduction number, $R_0=2-2.5$) and has exceeded the capacity of health services all over the world due to its rapid spread¹⁴. When the World Health Organization announced that 20% of all patients required inpatient care and 25% required intensive care, all countries had to redesign their healthcare systems according to the current patient load⁷⁻¹⁰.

As we review the literature, we note that case reports and surgical departments discuss the effects of the COVID-19 pandemic. In light of the data that we have shared, our research represents

an important study that encompasses an objective examination of all operations carried out by all surgical departments of the Tertiary Care Regional Hospital during the pandemic period, as well as the anesthesia methods used in the operations.

The first COVID-19 case in our country was detected and hospitalized in Istanbul on March 11, 2020. In order to prepare for the current patient burden in our country, the Ministry of Health stopped elective cases as of this date. It was decided that emergency cases, births, and cancer cases should continue as a priority^{15,16}.

Our study found that the total number of cases included in the operation decreased by 17.63%, and this decrease was statistically significant. Dobbs et al¹⁷ reported that the number of surgical procedures in England and Wales declined by 33.6% in 2020, and more than 1.5 million surgeries were canceled. These postponements and accumulated surgeries were predicted to continue during the pandemic. As reported by the National Health Service in England¹⁸, the total number of applications declined by 56.6%. The data of our study were similar. In our view, countries' lockdown measures were effective at reducing the number of cases to protect their hospital capacity,

as well as people being afraid to seek treatment in hospitals due to the fear of infection¹⁷⁻²⁰.

In our evaluation based on emergency surgical operations, the number of cases in the pre-pandemic period was 2,478, while the number of cases urgently operated in the pandemic period was 4,248, with an increase of 71.43%. Wade et al²¹ in a study of 338 patients reported that in the first seven weeks of the COVID-19 pandemic, the emergency surgical burden had decreased by 44%. An interstate study by Boserup et al²² reported a 31% to 45% decrease in emergency admissions. The difference between these studies and ours may be due to the fact that our study was conducted during the early stages of the COVID-19 pandemic, when lockdown restrictions were stricter. Additionally, we believe that people may have had higher reservations about applying to a hospital during the first stages of the pandemic due to the fear of contracting the disease. Since our study spans a longer period and includes a period when restrictions decreased, we believe the number of surgeries is highly indirectly related to an increase in the number of patients admitted to the Emergency Department. According to our assessment, stopping the operations of the hospitals that provided secondary care services in our region as well as allocating these hospitals to pandemic patients and transferring their cases to our hospital may have resulted in a greater number of emergency cases²¹⁻²⁴.

When the surgical department was examined and we evaluated the effects of the pandemic, there was a significant decrease in the number of cases in all surgical branches except Neurosurgery, Orthopedic Surgery and ENT. The most affected surgical department was Plastic and Reconstructive Surgery, with a decrease of 45.41%. While Cardiovascular Surgery decreased by 37%, Thoracic Surgery decreased by 34.69%, Pediatric Surgery by 32.66%, Ophthalmology by 20.88%, General Surgery by 16.61%, Obstetric Surgery by 15.98%, and Urologic Surgery by 11.49%. On the other hand, ENT had the highest increase in cases during the pandemic period with 74.7%, Neurosurgery had the second highest increase with 19.43%, and Orthopedic Surgery had the third highest increase with 3.38%. Our data show an overall decrease in the number of surgical procedures; however, when we examined surgical departments, a significant disparity was apparent. Several factors can be attributed to the change in the number of operations. In addition to reduced health-seeking behavior caused by fear of getting COVID-19 and not wanting to go to the hospital during the pandemic, stop-

ping elective operations by the Ministry of Health was another very effective factor²⁵⁻²⁷.

The increase in the number of physicians in the Neurosurgery and ENT departments and the decrease in restrictions in our hospital during the pandemic period is reflected in the number of surgeries. The increase of 3.38% in Orthopedic Surgery may be due to changes in human mobility and the definition of urgency for emergency orthopedic cases during the period in which pandemic restrictions were loosened. Moreover, the behavior of being operated and quickly discharged at the time of admission may have contributed to this increase in order to shorten hospitalization times without waiting for fracture patients and support the amount of beds allocated for the pandemic. Sugrue and Sullivan²⁸, in their study examining the first 25 days of quarantine, reported that the case load during the lockdown period was equivalent to the period before the pandemic. The results of this study are based on the increase in domestic injuries during the lockdown period and occupational accidents in working people who are exempt from lockdown restrictions. Shetty et al²⁹ stated in their study that orthopedic cases decreased by 54.2% during the first lockdown period in the United Kingdom. They stated that the applicant cases mostly had domestic fracture injuries and the number of cases increased when restrictions decreased. The results of our study support the literature.

When we compared all patients admitted to our hospital who underwent surgery by the method of anesthesia used before and during the pandemic, there was a statistically significant decrease in GA and in the use of LA, whereas there was a statistically significant increase in RA. Infected healthcare workers will further reduce the number of critical personnel in the fight against the pandemic. Therefore, avoidance of tracheal intubation among anesthesiologists may be an alternative method of anesthesia. In addition, postoperative respiratory changes due to GA, increase the need for critical care in patients with limited respiratory capacity. This places an additional burden on ICUs, which are limited during the pandemic. Therefore, anesthesiologists prefer the use of RA over GA. We know that the RA technique is better tolerated than the GA administration in terms of postoperative respiratory function. Cesur et al³⁰ reported a study of 126 anesthesiologists; 42.62% stated that they preferred RA in clinical anesthesia applications. In our study, while RA increased by 31.79%, we found a 22.7% decrease in the rate of GA and a 23.9% decrease in the rate of LA. While the total number of patients decreased, the increase in the

rate of RA shows that the health team prefers RA in the anesthesia method^{11,31-34}.

RA offers a clear solution to the multisystemic problems of COVID-19 patients. It provides safe and effective anesthesia with superior analgesia and low risk of postoperative complications compared to general anesthesia. If it is not urgent, surgery should be postponed in symptomatic COVID-19 patients. After recovery from COVID-19 disease, the profit/loss ratio between RA and GA should be determined based on data, as there is evidence^{11-12,35,36} that patients with perioperative COVID-19 who were operated under GA had a higher mortality rate and pulmonary complications.

Avoiding GA is important especially for patients who are COVID-19 positive, who require emergency surgery, and cannot tolerate respiratory reserve loss. The use of the RA technique for these operations, if appropriate, may reduce the risk of exposure of operating room personnel to a highly aerosolizing procedure such as tracheal intubation and reduce the need for intensive care due to postoperative respiratory complications in patients. During the administration of regional anesthesia and surgery, oxygen delivery with a surgical mask for the patient and the use of an FFP3 mask for the team can prevent viral transmission^{11,12}. Regional anesthesia can eliminate the need for anesthetic drugs needed in the ICU, as well as provide the economic use of limited resources. As fewer individuals are required in the anesthesia procedure conducted by an experienced physician, the use of FFP3 masks may be reduced¹².

When we examined the cases of surgical departments according to GA and RA methods:

Cardiovascular and thoracic surgery showed a significant decrease in the number of cases during the COVID-19 pandemic. The anesthesia method preferred during the pandemic period was found to be significantly GA. In their survey study, Gaudino et al³⁷ reported that 1/3 of cardiovascular surgery centers reported a 50% greater decrease in operation rates and in the number of ICU beds. As in the whole world, cardiovascular (CVS) operations have been canceled in these centers except for emergency operations. These data are supported in our study. In our hospital, the intensive care of the CVS unit continued only with emergency CVS cases without being used for pandemic purposes. The most preferred anesthesia method in emergency cases was GA, and the reason for its preference is the limitation of

RA application due to the use of blood thinners in CVS emergency surgeries.

There was a significant decrease in the number of cases in the Department of General Surgery. RA was found to be significantly higher in the selection of anesthesia methods in cases operated during the pandemic period. As a result of the evaluation of the studies in which laparoscopic surgery was performed in the Trendelenburg position, Major et al³⁸ suggested that RA laparoscopic surgery was a reliable method for operations during the COVID-19 pandemic. In another study by Cadili et al³⁹, it was stated that RA increased after the pandemic, and accordingly, early discharge rates increased in breast cancer surgeries. Romanzi et al⁴⁰ reported that awake laparotomy operations were safely performed under RA in geriatric patients with no-urgent limited cardiovascular and respiratory closures in 8 cases. Mai et al⁴¹ shared that open appendectomy was performed safely with RA in another study conducted in the United Kingdom. This finding supports the literature in our study. The rate of RA applied in decreasing operations has increased. During the pandemic period, RA was performed in open appendectomy cases in the operating room of our hospital. It has enabled large abdominal surgeries that cannot be postponed in limited intensive care conditions in patients with a borderline respiratory reserve who were predicted to need postoperative intensive care.

Although the total number of operations in the Neurosurgery department increased, when the cases taken under anesthesia in the operating room were evaluated, we found that it decreased by 19.5%, and the GA method was applied significantly in the cases during the pandemic period. Flexman et al⁴² stated in their study that the number of operations due to the postponement of electives of neurosurgery operations and the decrease in human mobility due to quarantine decreased, as in our study. Dobran et al⁴³ showed that there was a decrease in emergency neurosurgical trauma cases due to lockdown restrictions in Italy and that they attributed this to the reduced traffic and human movement during lockdown period, as well as the decrease in the number of nontraumatic neurosurgical cases, and the reason for this was that people did not apply to the hospital for treatment due to fear of disease. Sudhan et al⁴⁴ stated that the number of brain surgery cases decreased, but the number of emergency surgery cases did not change. In the same study, it was stated that mortality was high in cases taken with GA, and the use of awake

craniotomy and RA would achieve better results in selected cases. In our study, the increase in the number of surgeons during the pandemic period may explain the increase in cases, since it covers the period in which quarantine restrictions were loosened. In our opinion, the preference for general anesthesia is quite intense since most of the operations performed under anesthesia are emergency cranial procedures.

Obstetric-gynecologic surgery is one of the surgical departments where a significant relationship was found between the COVID-19 pandemic and anesthesia method preference. Despite the decrease in the number of cases, RA was applied at a rate of 6.7% before the pandemic, while this rate had the highest difference among all surgical departments, with 33.2% during the pandemic period. Karasu et al⁴⁵ stated in their study that they preferred the RA method in 95.1% of 61 pregnant COVID-19-positive patients and that RA can be used safely in these patients. Chen et al⁴⁶ stated in their study of 17 COVID-19-positive pregnant women that RA methods can be used safely. Zhong et al⁴⁷ reported that 49 COVID-19 positive symptomatic pregnant patients completed their operations with the RA method, and no postoperative pneumonia was observed. In the same study⁴⁷, it was stated that the rate of infection of anesthesia and surgical teams in cesarean operations performed with the RA method was significantly lower in those using FFP3^{48,49}. Our study supports the literature. Anesthesia teams and patients who were afraid of disease during the pandemic have a higher RA preference.

For Ophthalmologic surgery, the number of cases operated in the operating room decreased by 84.02% during the pandemic period. GA was applied to all patients as an anesthesia method. Busaidi et al⁵⁰ reported a 92% decrease in the number of patients, including emergency referrals, and other studies^{51,52} supported the results of our study. RA is not performed by anesthesiologists in the Ophthalmology department because the surgeons perform the ocular block as the RA technique. For this reason, a direct relationship between anesthesia and the pandemic could not be defined, except for the reasons of the decrease in the number of patients during the pandemic period, lockdown, and the patients not applying to the hospital due to fear of disease.

The number of cases taken under anesthesia in the department of Ear-Nose-Throat Surgery decreased by 35.42% during the pandemic period. All patients were operated under GA. Since our anesthesiologists did not have RA applications in

the ENT department, the relationship between the pandemic and the anesthesia technique could not be evaluated. Haapanen et al⁵³ stated in their study on pediatric patients in Finland that the number of operations decreased. In another study conducted in France, Hervochon et al⁵⁴ reported that the number of ENT surgeries decreased by 84%. The relatively low number of RA applications in the ENT department and the prevalence of GA may explain the limited number of publications on anesthesia management in the literature. In addition, considering that the examination of the ENT Department and surgeries create high aerosols, the application may have been avoided due to the potential to pose a high risk the surgical team in local anesthesia, and the GA orientation may have increased. More detailed studies are needed on this subject.

When the relationship between the pandemic and anesthesia method selection of the cases in the Orthopedic Surgery department was examined, we found that RA application was significantly preferred at a high rate (18.8%), although the number of patients decreased. In line with the quarantine decisions, the number of cases in the orthopedic department decreased in our hospital as well as all over the world. Besides, the RA is a frequently preferred practice in routine anesthesia. In a study by Ruterana et al⁵⁵, they defined an anesthesia method using local anesthetic and epinephrine injection by avoiding the use of a tourniquet called Wide Awake Local Anesthesia No Tourniquet (WALANT) and reported that they were safely applied in metacarpal or phalangeal fractures in hand surgery⁵⁶. Beathe and Memtsoudis⁵⁷ stated that they operated a 100-year-old COVID-19 positive patient with a hip fracture with the RA technique without any complications. Khadka et al⁵⁸ reported that they managed a patient without awake complications by applying a combined RA method of interscalene-superficial cervical plexus block in a case report of a 42-year-old clavicle fracture patient who was COVID-19 positive. Harvey et al⁵⁹ defined the RA method for the treatment of distal fractures as the gold standard during the pandemic period in their retrospective research of 90 patients. In the Heijnen et al⁶⁰ review publications, it has been stated that the use of ultrasound can be performed safely by protecting both the team and patients from the effects of COVID-19 by using the RA technique, which includes peripheral nerve blockade or neuraxial anesthesia methods, without the need for GA applications such as tracheal intubation. Our study supports the literature. Despite the pandemic period restrictions, home accidents and occupational accidents of the group

working actively in the pandemic seem to have created orthopedic cases. RA seems to be the most appropriate anesthetic technique for the rehabilitation of patients, including postoperative pain.

In the pediatric surgery department, no significant relationship was found between the pandemic and the anesthesia method. In their study, Ashkenazy et al⁶¹ stated that GA was used in pediatric cases and that protective measures should be taken to protect operating room personnel with modified intubation techniques. Reiter et al⁶² reported that postoperative complications were common in pediatric patients who underwent GA in 20 hospitals and those who were COVID-19 positive. In our study, the number of patients decreased, but no pandemic-related change was detected in the anesthesia method. Although the fact that children patients restrict the use of RA, Rajput et al⁵² published in their study that pediatric eye cases were performed safely and effectively with the sedation of the intravenous anesthetic agent added to the ocular RA^{61,62}. This finding supports the existing publications in our study. The number of our patients decreased by 38.63%. As the patient population consists primarily of children, RA method could restrict its application.

When the cases operated in the Plastic and Reconstructive surgery department were examined, no relationship was found between the pandemic and the anesthesia method preference. The GA and RA distribution rates were close to each other, as the surgical department was most affected by the pandemic. In their study, Obed et al⁶³ stated that, although the number of surgical cases decreased significantly, the number of emergency operations was not affected due to domestic injuries. Hence, in this regard, results of our study are in line with previous data in the literature. In another study conducted by Mohan et al⁶⁴, the “tumescent” anesthesia method, applied to male gynecomastia patients, was stated as an alternative method to general anesthesia and electrocautery during the pandemic period. Wang et al⁶⁵ and Bovill et al⁶⁶ reported that most emergency reconstructive surgery cases were completed with RA. While the low number of cases in our hospital supported the literature, it did not make a difference in terms of the anesthesia method used in the current operations. Furthermore, the fear of quarantine and disease infection may be a factor in the separation of the doctors working in this branch of our hospital, as well as a decrease in the number of patients seen.

A significant relationship was found between urologic surgery, the pandemic, and anesthesia method preference. We found that anesthesiolo-

gists significantly preferred RA in patients operated in the operating room during the pandemic period. Raimondo et al⁶⁷ stated that RA may be useful in performing operations without the need of invasive procedures in the respiratory tract during the COVID-19 pandemic in adnexial mass operations. In the same study⁶⁷, they stated that hospitalization time was short and pain palliation was superior in those operated on with RA. Gökce et al⁶⁸ in their study evaluating urinary stone treatments with data from 5 different countries and 11 centers, stated that they preferred RA in the anesthesia method. In their study, Poperta et al⁶⁹ suggested that RA was performed with appropriate protective equipment for prostate biopsy. This finding supports the literature in our study. Our hospital anesthesiologists preferred RA at a higher rate in urological operations during the pandemic period.

Limitations

The limitation of the study is that it contains very general data on the subject studied. In addition, we excluded surgical interventions performed outside the operating room. We think that these data should be studied in terms of real values of surgical workload. Also, all operations and anesthesia methods of each surgical department should be compared in detail. The data obtained will enable the effective use of operating rooms in future pandemics.

Conclusions

The COVID-19 pandemic has created disruptions in global medical supply chains, medical care delivery, and elective surgeries. This pandemic will not be the first nor will it be the last. During pandemics, we see the results of changes in practice behaviors for protecting healthcare workers and medical resources. During COVID-19 and possible similar pandemics in the future, this study may serve as a guiding source for the effective planning of both healthcare workers and medical equipment, which is limited, but valuable, as it indicates an unequal distribution of patients and surgical burdens among surgical departments during the current pandemic. The results of this study will serve as a resource for optimizing the use of drugs and anesthesia equipment, which will be limited given that the operating room has also encountered changes in anesthesia methods since the start of the pandemic. In conclusion, our study provides evidence that regional anesthesia can provide equipment pro-

tection as well as patient and personnel safety and supports its use during critical times.

Ethics Approval

The study was carried out with the permission of Hitit University Medicine of Faculty Hospital after the approval of the local ethics committee (Decision No: 2021-73).

Informed Consent

All patients signed the free and informed consent form.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Authors' Contributions

All the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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