

# Choice of anesthesia technique for emergent cesarean sections during COVID-19 era in a tertiary care hospital

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## ABSTRACT

**BACKGROUND:** This study explored the change of anesthesia management for emergent cesarean sections in our tertiary care hospital in the 1<sup>st</sup> year of pandemic. We searched primarily for the changes in spinal to general anesthesia rate and secondarily for presented adult and neonatal intensive care needs in comparison to the year before the pandemic. We also presented the post-operative polymerase chain reaction (PCR) tests of the emergent cesarean sections as a tertiary outcome.

**METHODS:** We retrospectively analyzed clinical data such as anesthetic technique, need for post-operative intensive care, duration of hospital stays, post-operative PCR result, and newborn status.

**RESULTS:** The rate of spinal anesthesia changed remarkably from 44.1% to 72.1% after the pandemic ( $p=0.001$ ). The comparison of the median duration of hospital stays of the pre-pandemic group and post-pandemic group was found significantly longer than that of the before coronavirus disease of 2019 (COVID-19) group ( $p=0.001$ ). The rate of need for post-operative intensive care in the after COVID-19 group was higher ( $p=0.058$ ). The rate of post-operative intensive care of the newborns in the after COVID-19 group was significantly higher than that of the before COVID-19 group ( $p=0.001$ ).

**CONCLUSION:** The spinal anesthesia rate for emergent cesarean sections increased significantly during the peak of the COVID-19 pandemic in tertiary care hospitals. Total health care services after the pandemic were enhanced as seen with elevated numbers of hospital stays, postoperative need of adult and neonatal intensive care.

**Keywords:** Cesarean sections; coronavirus disease of 2019; general anesthesia; neonatal intensive care; postoperative intensive care; spinal anesthesia.

## INTRODUCTION

The outbreak of coronavirus-2 (SARS-CoV-2), which initially started in Wuhan, China, in December 2019, has turned into an ongoing pandemic with the declaration of the World Health Organization (WHO) on March 11, 2020. On the same date, Turkey announced the first case of coronavirus disease of 2019 (COVID-19), and the first patient in our hospital was investigated on the March 10 in our intensive care unit. Since then, a lot has been learned and medical services were arranged to adapt to this ongoing new situation. Re-

sources of health-care systems were reserved for COVID patients and inevitable emergencies one of which is cesarean section.

Anesthetic management of cesarean sections includes either general or neuraxial anesthesia (epidural, spinal, or combined spinal-epidural anesthesia). Among them, neuraxial techniques have been preferred by most authorities. However, in Turkey, general anesthesia rates are still higher than the rates of general anesthesia administrations in Western European countries.<sup>[1]</sup> Although regional anesthesia rates were getting

Cite this article as: Çalışkan B, Suvarioğulları M, Ekmez M, Şen Ö, Yarsilikal Guleroglu F. Choice of anesthesia technique for emergent cesarean sections during COVID-19 era in a tertiary care hospital. *Ulus Travma Acil Cerrahi Derg* 2023;29:00-00

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*Ulus Travma Acil Cerrahi Derg* 2023;29(4):458-462 DOI: 10.14744/tjtes.2023.97580 Submitted: 09.02.2022 Revised: 18.01.2023 Accepted: 22.01.2023  
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higher in our country, this rise seems to have happened mostly at university hospitals, not in tertiary care centers like ours. The reason could be in correlation with the sociocultural status of the residents in the location of our hospital. The population admitted to training and research hospitals most likely does not give consent to regional anesthesia. Moreover, they cannot cooperate during surgery even if the spinal anesthesia is successful, they need general anesthesia because of their agitation. Several studies showed a change in rates in favor of regional anesthesia in Turkey, but all these rates were not specified in emergency cases. Besides the latest rate for regional anesthesia for overall cesarean sections was documented as 82% whereas 65.2% in case of emergency in one of our university hospitals.<sup>[1]</sup> Moreover, general anesthesia may still be the most appropriate choice in some emergent instances where time to apply anesthesia is limited such as acute fetal bradycardia and the possibility of severe hemorrhage such as placental abnormalities with foreseen hemodynamic instability. After COVID-19, the preference for the anesthetic technique for emergent cesarean sections in tertiary care hospitals has changed with worldwide consensus. The European and American Societies of Regional Anesthesia have designed recommendations that regional anesthesia should be chosen whenever possible, and societies even advise saving drugs in use for intensive care units during the pandemic.<sup>[2,3]</sup>

In our point of view, lately, general anesthesia rates for cesarean sections have declined indeed, but not at high rates when it is up to emergent cases. However, COVID-19 could have changed this as well. Few investigations have analyzed the rates of general and regional anesthesia at obstetric units and find out an increase in regional techniques.<sup>[4,5]</sup> However, none of them has focused on emergent cases when general anesthesia is more probable than elective cases. We believed that monitoring changes in anesthetic management rates for emergent cesarean sections can mirror the effects of COVID-19 and lead us to analyze contributory factors, maternal and fetal morbidity, mortality, and even clinical effects of choice of anesthesia on pregnant women found out polymerase chain reaction (PCR) positive after emergent cesareans. For this purpose, we present a retrospective analysis of our tertiary care hospital primarily to search for the changes in spinal to general anesthesia rates in the 1<sup>st</sup> year of COVID-19 concerning the year before. We also investigated maternal and fetal mortality morbidity. Besides we exhibited the numbers of PCR-positive cases after surgery, concerning anesthetic choice and clinical deterioration.

## MATERIALS AND METHODS

After ethical approval of our Institutional Ethics Committee (approval number: 50–2021) within which the work was undertaken, the study was conducted by the provisions of the Declaration of Helsinki in 1995 (as revised in Brazil 2013). All the subjects within the study gave informed consent and patient anonymity was preserved. We accomplished a retro-

spective analysis of emergency cesarean sections at our tertiary care hospital, before (March 2019–March 2020) and after COVID-19 (March 2020–March 2021). The total amount of pregnant women investigated was 452 before COVID-19 and 451 after COVID-19. We searched for information such as anesthetic technique, duration of post-operative intensive care or hospital stay, post-operative PCR result, and newborn status.

The primary outcome was the change in the ratio of general anesthesia to spinal anesthesia for emergent cesarean sections after COVID-19. The secondary outcome was the evaluation of maternal hospital stay and newborn status regarding the choice of anesthesia. The tertiary outcome was PCR test results after surgery to evaluate the incidence rate of undetected COVID-positive patients before emergent caesarian sections and its effect on maternal and fetal morbidity and mortality.

## Statistical Analysis

Data were analyzed with IBM SPSS v23 (IBM, USA) and variables were presented as mean with SD, median with interquartile range, or count with percentage. The distribution of numeric variables was analyzed with the Kolmogorov–Smirnov test. T-tests or Mann–Whitney tests were used for comparisons of numeric data as appropriate. Categorical variables were compared with the Chi-square test.  $P < 0.05$  was considered statistical significance.

## RESULTS

Table 1 presents the baseline clinical characteristics of the before and after COVID-19 study groups. The rate of spinal anesthesia in the after COVID-19 group was significantly higher than that of the before COVID-19 group ( $p=0.001$ ). The median ages, body mass index, and operation times of the study groups were found similar ( $p=0.763$ ,  $p=0.514$ , and  $p=0.730$ ). The median duration of hospital stays of the study groups was found significantly longer than that of the before COVID-19 group ( $p=0.001$ ). The rate of need for post-operative intensive care of the patients in the after COVID-19 group was higher than that of the before COVID-19 group ( $p=0.058$ ). The rate of need for post-operative intensive care of the newborns in the after COVID-19 group was significantly higher than that of the before COVID-19 group ( $p=0.001$ ). The number of newborns recorded as neonatal loss after birth was 14 (3.1%) all of which were included in the after COVID-19 group. The median APGAR scores (APGAR 1<sup>st</sup> and 5<sup>th</sup>-min scores) of newborns were found similar ( $p=0.155$ ;  $p=0.326$ ).

We treated all emergency patients as suspected COVID-19 cases and took PCR tests if possible. Within the after COVID-19 group, the number of PCR positive patients was 45 (10.0%); PCR negative patients were 335 (74.1%) and the number of patients without a PCR test was 72 (15.9%).

**Table 1.** Baseline clinical characteristics of the study population

	Before COVID-19 (n=451)	After COVID-19 (n=452)	p-value
Mode of anesthesia, n (%)			
General	237 (52.5)	126 (27.9)	0.001
Spinal	199 (44.1)	326 (72.1)	
Spinal plus general	15 (3.3)	0 (0)	
Age (year)	28.00 (16–45)	28.00 (17–47)	0.814
BMI of mothers	32 (35–30)	31 (35–29)	0.514
Operation times (minute)	43 (32–50)	43 (43–50)	0.730
Postoperative ICU, n (%)	1 (0.2)	6 (1.3)	0.058
Hospital stays (day)	2.0 (1–16)	3.0 (2–34)	0.001
Newborn ICU, n (%)	102 (22.6)	174 (38.5)	0.001
APGAR 1 <sup>st</sup>	9 (0–10)	9 (0–9)	0.155
APGAR 5 <sup>th</sup>	10 (0–10)	10 (0–10)	0.326

Data are expressed as count (%) and median with range. BMI: Body mass index; ICU: Intensive care unit.

## DISCUSSION

This study has shown a reduction in the rate of general anesthesia from 52.5% to 27.9%, and a significant increase in the rate of spinal anesthesia from 44.1% to 72.1% for emergent cesarean sections in a tertiary care hospital in Istanbul within the 1<sup>st</sup> year of COVID-19.

At the very beginning of the pandemic globally announced anesthetic recommendations advised the use of regional anesthesia where possible.<sup>[6]</sup> Since general anesthesia is an aerosol-generating procedure, regional anesthesia has generally been preferred to limit contamination within hospitals and protect healthcare workers during the COVID-19 pandemic. One of the latest systematic reviews and meta-analyses acclaimed that infection rates of healthcare workers increased so far related to workplace exposure and contact.<sup>[7]</sup> In the case of emergent surgeries as in cesarean sections, recommendation of neuraxial anesthesia becomes stronger.<sup>[6]</sup> In our study, post-operative PCR tests of the after COVID-19 group resulted positive at 10% and 15.9% of patients were even overlooked. The rise of spinal anesthesia rates could diminish contamination in our facility. This could be because of two perspectives: Protection will of our medical staff and patients as well. Similarly, many studies have prioritized the protection of health-care providers.<sup>[8]</sup> Even though our obstetric anesthesiology department prioritizes neuraxial anesthesia for cesarean section, rates of general anesthesia practice are still higher than in many countries because of our patient population. Before COVID-19, it was more difficult to convince a pregnant woman of the benefits of regional anesthesia. However, after COVID-19, patients have been aware of possible risks of transmission and avoided general anesthesia because of their fear of intubation.<sup>[2]</sup> Even patients who got agitated after a while during surgery under regional anesthesia and urged for

general anesthesia seem to be lesser after COVID-19. In our results, we never encountered spinal and general anesthesia combinations after COVID-19 patients. However, 15 patients before COVID-19 needed general anesthesia because of agitation after at least 20 min of surgery had passed. Similarly, Karasu et al.<sup>[9]</sup> reported a significant increase of 76.2–95.1% in the rate of regional anesthesia in cesarean patients during the COVID-19 outbreak and recommended spinal anesthesia, especially in PCR-positive obstetric patients with pneumonia.

It was noted that after the COVID-19 pandemic, newborns remarkably needed more neonatal intensive care. In our study population, we encountered 14 neonatal losses and all of them were recorded after the COVID-19 pandemic. The previous studies examined fetal outcomes of COVID-positive pregnant women and exhibited perinatal outcomes of stillbirth, neonatal death, neonatal sepsis, and an increased rate of neonatal unit admission.<sup>[10]</sup> A large recent overview of reviews so far presented neonatal intensive care unit (ICU) admission as the most frequent complication related to COVID-19.<sup>[11]</sup> Regarding maternofetal transmission, a precise decision is hard to come up with because of the environmental conditions affecting newborns after birth. However, it was strongly assumed that there was no vertical transmission.<sup>[11]</sup> Besides even the WHO cannot state if a woman can pass the virus to her baby during delivery or pregnancy as well. In our study group, pregnant women who tested positive postoperatively have newborns tested mostly negative. Centers for Disease Control and Prevention reported that most of the COVID-19-positive newborns easily recovered and fewer developed severe symptoms. Among 45 PCR-positive patients in our study, 37 of their newborns needed ICU and four newborns announced death within the 1<sup>st</sup> h of delivery. Therefore, only four of the newborns of COVID-positive patients did not receive special care. This finding supported the asso-

ciation for the rise of intensive care needs of newborns after COVID-19. However, according to APGAR scores, there was no significant change after COVID-19.

Our study has some limitations. Considering the overall status of emergent cesarean sections in Istanbul, our hospital has a somewhat higher rate of cesarean sections since it generally accepts referred pregnant women during the study period. There may be a need to combine all the relevant data of tertiary care centers in Istanbul. At the beginning of the pandemic, we did not have a procedural organization, so we missed PCR tests and details of maternal baseline characteristics, maternal morbidity, or mortality. We could not analyze detailed information on the progress of these newborns admitted to the ICU.

## Conclusion

Overall, the general anesthesia rate for cesarean sections declined significantly during the peak of the COVID-19 pandemic. After COVID-19, the duration of hospital stay and post-operative intensive care needs were also high representing the rising costs of the pandemic to the healthcare system. The increased rate of neonatal ICU needs uncorrelated with PCR-positive mothers would possibly be clarified with more data in near future. Further analysis of anesthetic management strategies for emergent cesarean sections after COVID-19 would clarify the choice of anesthesia and rearrange the conditions of each facility.

**Ethics Committee Approval:** This study was approved by the Haseki Training and Research Hospital Clinical Research Ethics Committee (Date: 09.06.2021, Decision No: 50-2021).

**Peer-review:** Externally peer-reviewed.

**Authorship Contributions:** Concept: B.Ç.; Design: B.Ç., Ö.Ş.; Supervision: F.Y.G., Ö.Ş.; Resource: M.S.; Materials: M.S., F.Y.G.; Data: M.S., M.E.; Literature search: B.Ç.; Writing: S.Ç.; Critical revision: Ö.Ş., F.Y.G., M.E.

**Conflict of Interest:** None declared.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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## ORJİNAL ÇALIŞMA - ÖZ

**Kovid-19 döneminde üçüncü basamak bir hastanede acil sezaryen doğumlarda anestezi yönetimi seçimi****Dr. Berna Çalışkan,<sup>1</sup> Dr. Merve Suvariogulları,<sup>1</sup> Dr. Murat Ekmez,<sup>2</sup> Dr. Öznur Şen,<sup>1</sup> Dr. Filiz Yarsilikal Guleroglu<sup>2</sup>**<sup>1</sup>Istanbul Haseki Eğitim ve Araştırma Hastanesi, Anesteziyoloji ve Reanimasyon Anabilim Dalı, İstanbul<sup>2</sup>Istanbul Haseki Eğitim ve Araştırma Hastanesi, Kadın Hastalıkları ve Doğum Anabilim Dalı, İstanbul

**AMAÇ:** Bu çalışma pandeminin ilk yılında tersiyer bakım hastanemizdeki acil sezaryen doğumlarda anestezi yönetiminin değişimini araştırdı. Öncelikle spinal ve genel anestezi oranlarını, ikincil olarak yetişkin ve neonatal yoğun bakım ihtiyaçlarını pandemik öncesi yıla göre karşılaştırdık. Ayrıca üçüncül bir sonuç olarak acil sezaryen doğumda ameliyat sonrası PCR testlerini sergiledik.

**GEREÇ VE YÖNTEM:** Anestezi tekniği, ameliyat sonrası yoğun bakım, hastanede kalış süresi, ameliyat sonrası PCR sonucu ve yenidoğan statüsü gibi bilgileri geriye dönük olarak analiz ettik.

**BULGULAR:** Pandemiden sonra spinal anestezi oranı dikkat çekici şekilde %44.1'den %72.1 oranına değişti ( $p=0.001$ ). Çalışma gruplarının ortanca süresi, Kovid-19 öncesi gruptan belirgin derecede uzun bulundu ( $p=0.001$ ). Kovid-19 sonrası grubundaki hastaların ameliyat sonrası yoğun bakım ihtiyacı oranı daha yüksekti ( $p=0.058$ ). Kovid-19 grubundaki yenidoğanların ameliyat sonrası yoğun bakımının oranı, Kovid-19 öncesi grubundan anlamlı olarak daha yüksekti ( $p=0.001$ ).

**TARTIŞMA:** Kovid-19 pandemisi sırasında üçüncü basamak hastanelerde acil sezaryen doğumlarında spinal anestezi oranı önemli ölçüde artmıştır. Hastanede kalım sayıları, yetişkin ve yenidoğan yoğun bakım ihtiyaçlarının yükselmesi ile görüldüğü üzere pandemi sonrası toplam sağlık bakım hizmetleri çoğalmıştır.

**Anahtar sözcükler:** Ameliyat sonrası yoğun bakım; genel anestezi; Kovid-19; sezaryen doğum; spinal anestezi; yenidoğan yoğun bakım.

Ulus Travma Acil Cerrahi Derg 2023;29(4):458-462 doi: 10.14744/tjtes.2023.97580