

# The Impact of COVID-19 Outbreak on Electrophysiological Procedures: A Single-Center Tertiary Experience

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## ABSTRACT

**Objective:** We aimed to investigate the impact of novel coronavirus pandemic on the number and diversity of electrophysiology procedures in a tertiary referral electrophysiology unit in Turkey.

**Methods:** All consecutive electrophysiology procedures were retrospectively analyzed performed in our electrophysiology department between January 2017 and March 2021. The number of procedures and the distribution of cases per month were calculated preceding and during the pandemic. The diversity of the procedures was also evaluated. We compared the number of electrophysiology procedures between pre-coronavirus disease and post-coronavirus disease period.

**Results:** Overall, the electrophysiology procedures were decreased by 11.1% compared to previous years ( $P = .017$ ). The most significant difference was observed in April ( $-89.8\%$ ), May ( $-66.1\%$ ), November ( $-21.7\%$ ), December ( $-29.4\%$ ) 2020, and the first month of 2021 ( $-38.8\%$ ). These intervals coincided with the peak coronavirus disease incidence in our country. Atrial fibrillation and supraventricular tachycardia ablation rates significantly dropped by 22.2% ( $P = .038$  and  $P = .039$ ; respectively) throughout the coronavirus disease outbreak; however, only mild non-significant change occurred in the number of ventricular tachycardia ablations.

**Conclusion:** The coronavirus pandemic has significantly affected the number of electrophysiological studies in our center. It is apparent that this pandemic will be affecting our practice for a while. We need to develop contemporary measures to improve healthcare for non- coronavirus disease patients.

**Keywords:** Electrophysiology, COVID-19, arrhythmia, coronavirus

## INTRODUCTION

Coronavirus disease 2019 (COVID-19) was declared as a pandemic on March 11, 2020, by the World Health Organization and spread throughout the world rapidly.<sup>1</sup> The novel coronavirus infected more than 3 million Turkish inhabitants since its first detection in March 2020.<sup>2</sup> The capacity of the hospitals was overwhelmed by the increasing number of affected individuals. Most of the countries prioritized COVID-19 management and implemented extensive precautions such as social distancing and suspending elective procedures to overcome this unprecedented situation. Hospitals rearranged their in-hospital services to divert their all existing sources through this challenging period. Officials announced avoiding hospital admission in non-emergent/non-urgent conditions.

Coronavirus disease 2019 has devastating and life-threatening outcomes relating to the cardiovascular system; arrhythmias are

frequently observed as a result of medications and the complications that occurred by the disease itself.<sup>3,4</sup> Thus, all units and cardiac electrophysiologists only performed highly essential procedures in non-COVID patients to minimize the risk of disease transmission as well as to prevent healthcare system crisis. Consequently, the overall usual patient care was hampered unwillingly. Herein, we report our experience about the impact of the COVID-19 outbreak on the number and the diversity of electrophysiological (EP) procedures conducted at a tertiary referral center in Turkey.

## METHODS

### Data Collection

This is a single-center observational retrospective study. We analyzed all consecutive electrophysiological procedures performed in a tertiary referral center between January 2017 and March 2021. Procedures were divided into 2 main groups: (i) procedures

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performed before the declaration of COVID-19 outbreak (pre-COVID) and (ii) procedures performed after the declaration of COVID-19 outbreak (post-COVID). The procedural distribution was also categorized into 4 quarters: (i) January 1 to March 31 (first quarter), (ii) April 1 to June 31 (second quarter), (iii) July 1 to September 30 (third quarter), and (iv) October 1 to December 31 (fourth quarter). The data were extracted from the electronic health record system of our hospital. The mean number of studies was calculated for each month and quarter preceding January 2020. These parameters were compared with the post-COVID numbers calculated in the same way.

Procedures were categorized as ventricular tachycardia (VT) ablation, atrial fibrillation (AF) ablation, and supraventricular tachycardia (SVT) ablation. Atrial fibrillation ablations performed either by cryoballoon or radiofrequency ablation were included in this subgroup. The supraventricular tachycardia ablation group consists of atrioventricular nodal reentrant tachycardia, atrioventricular reentrant tachycardia, and atrial tachycardia (AT). All procedures were also sub classified as conventional ablation procedures which were performed without 3-dimensional electroanatomic mapping systems and complex ablation procedures which were performed via 3-dimensional electroanatomic mapping systems.

**Periprocedural Precautions**

A detailed assessment for COVID-19 symptoms was done on all patients scheduled for the EP study. A routine polymerase chain reaction test for the novel coronavirus was obtained in whom general anesthesia was preferred (catheter ablation of VT, AF, and AT). On detecting a positive test, the procedure was postponed if the medical condition was deferrable. Periprocedural measures were undertaken to minimize the risk of transmission according to local institutional recommendations.

**Statistical Analysis**

All analyses were done using Statistical Package for the Social Sciences software version 25 (IBM SPSS Corp.; Armonk, NY, USA). Categorical data were depicted using percentage and frequency and numerical data were depicted using means and standard

deviations. Chi-square or Fisher’s test was used to compare 2 groups as appropriate. *P*-value < .05 was considered statistically significant.

**RESULTS**

The average number of annual EP procedures performed in our center was 762 in the pre-COVID period. Overall, the number of procedures decreased by 11.1%. In total, 677 studies were performed during the COVID outbreak. The procedural details are depicted in Table 1. The number of AF and SVT ablations significantly reduced by 22.2% during the COVID pandemic (*P*=.006 and *P*=.003, respectively) On the other hand, there was a statistically non-significant increase in the number of VT ablation during the COVID pandemic compared to pre-COVID time (+3%, *P*=.036). April (89.8%) and May (66.1%) were the months when the most significant patient decrease was observed (*P* < .001) We performed AF ablation in 3 patients, VT ablation in 1 patient, SVT ablation in 4 patients in April and AF ablation in 9 patients, VT ablation in 5 patients, SVT ablation in 8 patients in May. Moreover another significant drop was noticed in November (21.7%) and December (29.4%) (*P*=.039 and *P*=.038, respectively). The comparison of the amount of procedural distribution throughout the pandemic is depicted in Figure 1. The patient admission continued to decrease in January 2021 where a statistically significant reduction was observed compared to both the pre-COVID period (38.8%; *P*=.009) and the previous year (58.4%; *P* < .001). We also analyzed the procedural distribution in 4 quarters to minimize the potential month-to-month variability, and we observed a reduction in the procedural rate (54.9%) during the second quarter (April-May-June) compared to previous years (Figure 2).

**DISCUSSION**

In the present study, we aimed to evaluate the effect of a novel COVID pandemic on the EP procedures performed in our department. The findings of our study can be summarized as follow: (i) the number of electrophysiological studies significantly reduced during the pandemic compared to previous years, (ii) there was 3 distinct period during which the most significant reduction occurred, April to May 2020, November to December 2020, and

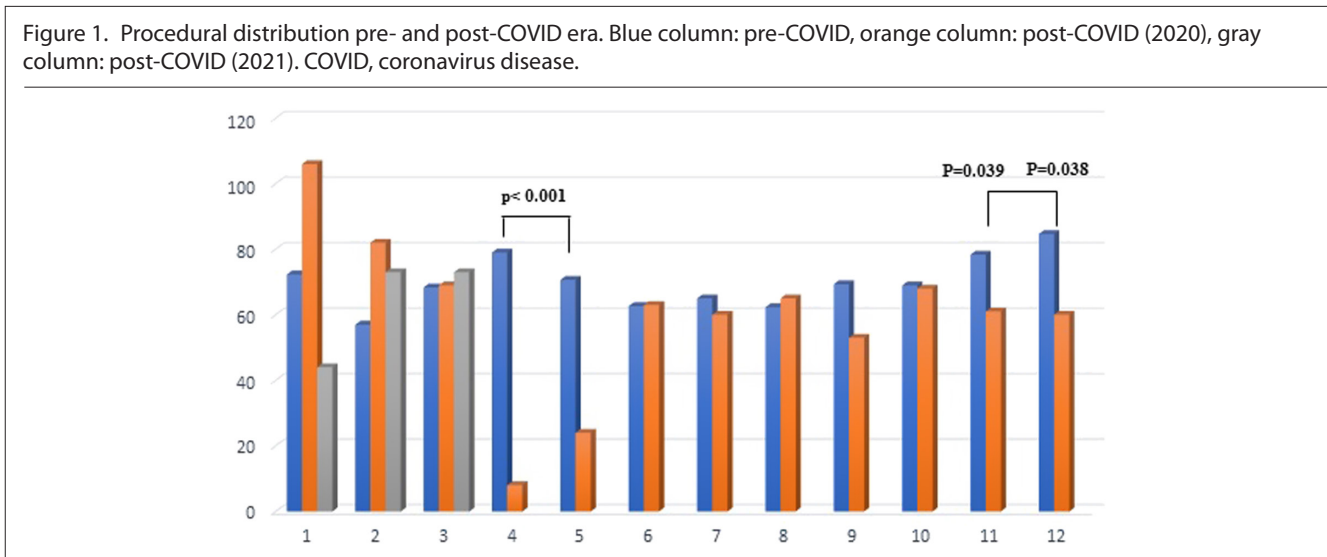
**Main Points**

- We report the impact of the coronavirus disease (COVID) pandemic on the electrophysiology (EP) procedures performed in our EP department which showed a significant reduction compared to the pre-COVID period.
- Overall, the effect is inversely correlated with the course of the pandemic. The most significant decrease was noticed in April, May, November, and December when the COVID-19 incidence was the highest.
- The catheter ablation of atrial fibrillation and supraventricular tachycardias were markedly reduced, while no significant difference was observed in terms of ventricular tachycardia ablation compared to previous years.
- We also observed that rebooting normal activity was instantly provided when the incidence of COVID-19 was under control.

**Table 1.** The Procedural Details Before and During COVID-19 Outbreak

	Pre-COVID (n)	Post-COVID (n)	<i>P</i>	Change (%)
Complex EP (3D mapping)	628	538	.008	-14.3
Conventional EP	134	139	.717	+3
VT ablation	96	109	.364	+13.5
AF ablation	274	213	.006	-22.2
SVT ablation	319	248	.003	-22.2
Total	762	677	.017	-11.1

EP, electrophysiology; VT, ventricular tachycardia; AF, atrial fibrillation; SVT, supraventricular tachycardia; 3D, 3 dimensional; COVID, coronavirus disease.



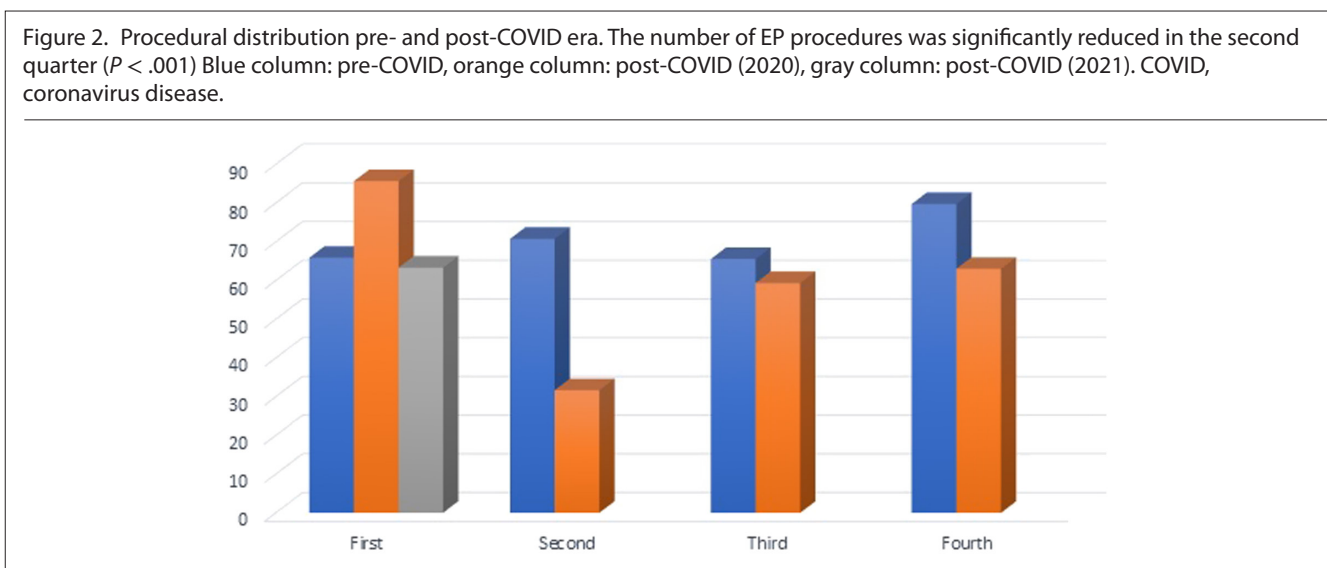
at the beginning of 2021, (iii) the rate of procedures was similar to the pre-COVID period during the remaining months of the year, and (iv) we also observed that the number of VT ablations was not affected by the outbreak whereas all other EP procedures decreased in the same period.

The current outbreak directly or indirectly affected the routine daily function of the hospitals. Several recommendation papers were published recently about the organization of EP units and appropriate patient triage during the pandemic.<sup>5-7</sup> Nevertheless, massive COVID-related hospital admissions occupied most of the clinics which in turn limited and hampered non-COVID patient care in clinical practice.

Previously, several clinical and survey studies all over the world demonstrated similar results at the beginning of the pandemic.<sup>8,9</sup> The number of cardiac device implantation and EP

procedures was extremely reduced in all countries especially when the pandemic intensified. More than 50% of the reduction was observed in high-volume EP laboratories.<sup>10,11</sup> Non-COVID-patient care was jeopardized as the COVID incidence accelerated. Current data show us that the fluctuating course in the number of cases during the pandemic causes serious disruptions in the treatment and follow-up of patients without COVID-19. It is apparent that the physicians are trying to adapt themselves to this challenging disease. Although more than a year has passed since the onset of the pandemic, there has been an unpreventable increase in the COVID-19 incidence and mortality rates. Unfortunately, it seems that we will continue to face the current situation for a while. Thus, we need to do our best to ensure that arrhythmia patients receive adequate treatment.

In our analysis, there was 2 distinct time interval when we observed a marked reduction in the number of procedures. These intervals were correlated with the peak COVID-19 incidence in



our country. Although we tried to perform all undeferrable and essential procedures, the number of patients was inevitably influenced by the pandemic.

Interestingly, our data showed that the incidence of VT ablation did not differ from previous years. A survey study conducted in Poland among electrophysiologists showed similar results that all other EP procedures including cardiac device implantation reduced significantly in the second quarter of the year, while the number of VT ablation was found to be similar or higher in their clinical practice.<sup>12</sup> The finding may be due to the fact that VT ablation is more urgent than the other procedures, and unlike AF or SVT ablation, it is undeferrable. Also, this may be a coincidental presentation.

The significant reduction in the rate of EP studies is considered to be multifactorial. First, this may be attributable to the hesitance of the patients on hospital admissions to avoid COVID transmission. Besides, elective procedures were deferred by the physicians as recommended during the periods of increased COVID-19 incidence to prevent hospital overload. Moreover, we admit a considerable amount of patients from all across the country as being a referral center. Thus, general orientation in the healthcare system is also reflected in our procedural statistics. Additionally, we need to keep in mind that the electrophysiologist, as well as physicians, from other specialties were assigned to a COVID unit or were infected by the disease which also had a negative influence on our EP practice.

Another issue that needs to be addressed is the potential long-term complications of the novel COVID infection. Although acute respiratory distress is the principal manifestation in the majority of the cases, multisystemic involvement including the cardiovascular system is common. Coronavirus disease-related arrhythmias are associated with high mortality and morbidity in hospitalized patients.<sup>13</sup> Several mechanisms were proposed as responsible triggers for the arrhythmia development.<sup>14</sup> Additionally asymptomatic myocarditis is also prevalent in patients recently recovered from severe acute respiratory syndrome coronavirus-2 (SARS-CoV 2) infection which was illustrated by cardiac magnetic resonance imaging.<sup>15</sup> The long-term consequences of possible arrhythmic complications in individuals exposed to SARS-CoV 2 virus are unknown yet. Potentially, electrophysiologists will have to encounter such patients in the future which will increase the burden of EP units significantly. Rebooting usual patient care is of utmost importance in this setting.

#### Limitations

There are several limitations of our study. First, this is a single-center retrospective observational study. Multicenter studies from different regions are needed to confirm our findings. Second, we only observed a specific time interval so we are unable to make any assumption about the long-term outcome of this pandemic on arrhythmia patients. Furthermore, since our country started vaccination recently, we have no data regarding its potential favorable impact on the overall healthcare system and the organization of EP laboratories.

## CONCLUSION

To our knowledge, this is the first study showing the effects of the current pandemic on an EP Unit in Turkey. Our study showed that the EP procedures were significantly affected by the outbreak. The pandemic created an unprecedented clinical scenario. The need for solid measures has emerged in the management of similar unexpected situations that we will encounter in the near future.

**Ethics Committee Approval:** This trial was a retrospective observational non invasive statistical study thus we did not apply for ethical approval.

**Informed Consent:** This was a retrospective study. No informed consent was available from the patients.

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