The Impact of COVID-19 on Elective Cardiovascular Procedures in Taiwan – A Single-Center Experience

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COVID-19 has reached a pandemic level and affected both individual's health and global healthcare systems. Although Taiwan has encountered a less severe COVID-19 pandemic than many other countries, it has impacted the workflow of all cardiovascular examinations and procedures. Compared to before January 21st, 2020 (the date of the first confirmed COVID-19 in Taiwan), the number of patients who have received echocardiography and cardiac catheterization has since fallen. However, the number of percutaneous coronary interventions being performed has remained at the usual level. Based on our experience, we suggest that healthcare providers in Taiwan should carefully evaluate the urgency of cardiovascular procedures and deferred non-emergent procedures. Given that the pandemic has not yet plateaued, we should remain prepared for future challenges to maintain our medical service.

Key Words: COVID-19 • Elective cardiovascular procedures • Workflow

INTRODUCTION

COVID-19 is caused by SARS-CoV-2 and has profoundly impacted global healthcare systems.¹ Amid the coronavirus pandemic, a number of healthcare providers have implemented corresponding measures to contain the high contagiousness and rapid spread.^{2,3} In Taiwan, a series of public health measures such as strengthening quarantine, retrospectively identifying potential cases, tracking infection paths and enforcing mask-wearing, has prevented lockdown and the collapse of the health-

Received: May 14, 2020 Accepted: September 20, 2020 ¹Division of Cardiology, Department of Internal Medicine, Chi-Mei Medical Center; ²Department of Public Health, College of Medicine, National Cheng Kung University; ³Department of Biotechnology, Southern Taiwan University of Science and Technology; ⁴Institute of Clinical Medicine, College of Medicine, National Cheng Kung University, Tainan, Taiwan. care system.^{4,5} Although the healthcare system has not been overwhelmed by the pandemic, clinical management, treatment strategies and considerations may differ substantially in different regions. In Canada, cardiac surgical programs have delayed elective procedures to reduce the burden on the healthcare system and prioritize resources.³ Likewise, to avoid SARS-CoV-2 spread during electrophysiological procedures, the American Heart Rhythm Association recommends resource conservation and telemedicine during the pandemic.² Nevertheless, a delay in medical examinations or therapy due to overwhelmed healthcare systems may negatively impact patients, prompt and safe healthcare delivery is challenging during the COVID-19 crisis.

COVID-19 AND CARDIOVASCULAR PROCEDURES IN CHI MEI MEDICAL CENTER

A multidisciplinary team and the workflow reform

At the beginning of the outbreak, our cardiovascular department collaborated with the infectious disease de-

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partment and the quality control department to reform the current workflow of all cardiovascular examinations and procedures because these procedures lead to close contact with the patients. The multidisciplinary team took into account the highly infectious coronavirus, prompt and optimal treatments, clinicians' safety and the healthcare provider's capacity, and subsequently developed strategies to meet the needs of the current regional situation and avoid being overwhelmed. All procedures needed administration after the results of a SARS-CoV-2 test for suspected patients. The operators were asked to become familiar with personal protective equipment (PPE); non-urgent procedures were deferred to preserve healthcare capacity, e.g., intensive care unit beds and clinician workforce; and some clinicians were designated as a rapid response team for emergency cases of suspected or confirmed COVID-19 patients, such as in-hospital cardiac arrest events. These measures reallocated resources and subsequently influenced the capacity of original healthcare services.

The impact on cardiovascular procedures

Amidst the COVID-19 pandemic, after resource reallocation, our institute was able to keep providing cardiovascular examinations and intervention therapies. However, the average volume of overall examinations and procedures moderately decreased (Figure 1 and Table 1). Compared to the numbers of procedures during the three months before and after 21st January 2020 (the date of the first confirmed COVID-19 case in Taiwan), the number of echocardiography, Holter, treadmill tests, and cardiac catheterization procedures fell from 1867 \pm 121, 223 \pm 49, 236 \pm 38 and 187 \pm 19 to 1486 \pm 102, 178 \pm 12, 167 \pm 27 and 155 \pm 20 cases per month, respectively. Even after comparing the numbers with the same period in 2019 to avoid a seasonal influence, the number of procedures still dropped substantially, i.e., 1740 \pm 269 in 2019 versus 1486 \pm 102 in 2020 for echocardiography, 188 \pm 11 in 2019 versus 178 \pm 12 in 2020 for Holter, 221 \pm 7 in 2019 versus 167 \pm 27 in 2020 for treadmill tests, 171 \pm 6 in 2019 versus 155 \pm 20 in 2020 for cardiac catheterization (Table 1). Nevertheless, in terms of percutaneous coronary interventions (PCIs) including elective, rescued, and primary PCIs, the number of procedures were maintained at the usual volumes irrespective of the year or the presence of the COVID-19 pandemic (i.e., 104 \pm 11 in 2019, and 111 \pm 14 and 110 \pm 13 within three months before and after the first case in 2020).

Perspective of the impact on cardiovascular procedures

Our analysis demonstrated that the COVID-19 pandemic contributed to a decline in the number of procedures except for PCIs. From our perspective, apart from avoiding hospital visits, social distancing, and quarantine to avoid contracting COVID-19, this phenomenon may be explained by the following reasons. First, the healthcare providers attempted to conserve medical



Figure 1. The number of procedures in Chi-Mei Medical Center three months before and after 21st January 2020 on which the first case of COVID-19 was confirmed in Taiwan.

Table 1. Comparison of the number of individual procedures in Chi Mei Medical Center before and after 21st January 2020 on whichthe first case of COVID-19 was confirmed in Taiwan

	19 Oct 2019-19 Jan 2020	20 Jan 2019-1 Apr 2019	20 Jan 2020-1 Apr 2020	p-value
Echocardiography (N \pm SD)	1740 ± 269	1792 ± 231	1486 ± 102	0.25
Holter (N \pm SD)	188 ± 11	227 ± 47	178 ± 12	0.17
Treadmill tests (N \pm SD)	$\textbf{221}\pm\textbf{7}$	197 ± 27	167 ± 27	0.04
Cardiac catheterization (N \pm SD)	171 ± 6	171 ± 18	155 ± 20	0.4
PCI (N \pm SD)	104 ± 11	111 ± 14	110 ± 13	0.8

PCI, percutaneous coronary intervention; SD, standard deviation.

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capacity and reallocate resources. The hospital policy may have led to a reduction in the volume of elective and non-emergent procedures, however Li et al. reported no significant reduction in admissions for ST-segment elevation myocardial infarction amidst the COVID-19 pandemic in Taiwan.⁶ Similarly, our findings reveal that the need for PCIs in patients remained irrespective of the presence of COVID-19. Second, the findings may imply that medical professionals have become more prudent when evaluating the urgency of coronary interventions, and that cardiac catheterization examinations are only arranged for patients with highly suspected coronary artery diseases. Then, the percentage of a need for PCIs among these patients increased correspondingly (Table 1).

Due to the relatively minor impact of the COVID-19 pandemic and transparent information in Taiwan, the public has not been put in lockdown and has been allowed to continue with their regular lives. Most healthcare providers have developed flexible and timely strategies according to the intensity of the COVID-19 pandemic. With the reallocation of resources, including multidisciplinary teamwork, reforming examination workflow, sufficient preparation of PPE, and familiarity with using PPE, the providers have maintained the healthcare services. Nevertheless, these measures may have influenced cardiovascular examinations and procedures. Our experience indicates that there are still patients who require mandatory therapy, and that they need prompt and safe healthcare services given the pandemic.

FUTURE CHALLENGES

Global healthcare systems are experiencing varying levels of strain amidst the pandemic. Through the efforts of the Taiwan Communicable Disease Control Act, we can currently maintain daily medical services instead of lockdown. Nevertheless, apart from the health policies of social distancing and quarantine, healthcare providers should consider reallocating resources to deal with the potential threat of the COVID-19 pandemic. We may need to prudently make a trade-off between providing prompt management and deferring procedures if COVID-19 returns, or there are outbreaks of other infectious diseases in the future.

CONFLICT OF INTEREST

All the authors declare no conflict of interest.

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