

COVID-19 and its impact on cardiology service

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Summary. COVID-19 has impacted the primary management of cardiac conditions worldwide, decreasing the number of interventions for coronary diseases. Elective treatments and imaging have been largely cancelled across the world to allow better allocation of resources towards COVID-19 patients. However, the impact of such delays for cardiac patients could prove drastic. Although the number of hospital patients presenting with coronary symptoms during the outbreak have decreased internationally, it is now imperative that safety protocols be upheld and life preserving surgeries be provided where appropriate. In this review, we discuss how COVID-19 has affected primary cardiac intervention globally, how services have been adapted to taking precautionary measures, and how morbidity rates can be reduced by introducing scoring systems and telemedicine. (www.actabiomedica.it)

Key words: COVID-19, cardiology, service provision, PCI

Introduction

COVID-19 has caused a state of alarm in societies across the world, impacting the care of various health conditions unrelated to the current outbreak. The diagnosis and treatment of acute coronary syndromes (ACS) have been affected due to the shift in focus of healthcare systems towards caring for COVID-19 patients (1). The number of cardiology interventions unrelated to COVID-19 has decreased in numerous countries over the past few months (2-6).

All elective, non-urgent procedures are cancelled, and medically fit inpatients have been urgently discharged in the UK in accordance to guidelines provided by NHS England on 17 March (7). This was to allow for more resources focused on combating COVID-19 and to reduce nosocomial infections. It has been proposed that the drop in cardiology procedures may also be the result of patients' fear of entering hospitals where they may be in greater proximity to COVID-19 patients (2). Overall, the cause of this decrease is multifactorial and the healthcare impact of COVID-19 lies far beyond the patients infected with the virus itself. With such focus

on infected patient, cardiovascular services will need to adapt to uphold precautionary measures and continue efficient provision of care. A risk stratification scoring system could be implemented to help identify patients who need earlier intervention.

Current global practice of cardiology intervention

The number of primary percutaneous coronary intervention (PPCI) for the treatment of ST-segment elevation myocardial infarction (STEMI) has decreased internationally (2-6). PPCI continues to be the procedure of choice for STEMI management in most countries amidst the virus outbreak (2-4). Here we review the data available for PPCI in various countries and discuss the causes of changes that COVID-19 has brought about in cardiology.

In a study in Spain, there was a 40% decrease seen when data was compared before and during the outbreak in February and March respectively (3). A part of this decrease could be attributed to the 5% of interventional cardiologists who were down with COV-

ID-19. The study also observed a slight increase in the use of thrombolysis although angioplasty was still the main treatment (3). Another study in Austria showed a decline of 39.4% in admissions for PCI due to ACS (4). It estimated that 275 patients were not treated in the month of March, and that the mortality of 110 ACS deaths occurred during this timeframe (4).

Similarly, analysis in the United States (US) has estimated a 38% decrease in PPCI for STEMI treatment (2). It is suggested that there should instead be an increase in PPCI due to STEMI induced by COVID-19, environmental and psychosocial stressors. In China, it is recommended that thrombolysis be given to patients with STEMI before PCI is considered in patients deemed necessary for further treatment (5). However, there were no reported numbers of PPCI in China compared before and during the outbreak.

Time taken for STEMI patients to present to hospital care, and the time taken to treat them have also increased. A review done in Hong Kong found that patients are presenting to hospital care later, taking 319 minutes from the time of symptom onset compared to about 88 minutes prior to the pandemic (6). This is a significant rise of almost four times the usual. Time of arrival in the catheterization laboratory to successful wire crossing time has also increased from approximately 22 minutes to 33 minutes (6). These delays may be attributed to limited staff num-

bers due to infection with the virus, and the need to don personal protective equipment (PPE) which can be time consuming and cumbersome.

The causes of the decrease in PPCI numbers are likely to be multifactorial. Some proposed the decrease may be the result of lower rates of smoking as the public fear it could increase their risks of catching the virus. Some believe that the decrease in physical activity due to city lockdowns reduces the likelihood of triggering an ACS. Patients may also confuse cardiac related pain with respiratory infection or another system pain. Table 1 summarizes the probable causes of the decrease in PPCI for STEMI management and the increase in catheterization laboratory to treatment time.

In most countries hit with high numbers of COVID-19 cases, elective procedures have been postponed during the outbreak creating an accumulation of cardiology cases. These figures showing a worldwide decrease in PPCI is worrisome and potentially have detrimental effects on patient mortality and morbidity in the long run.

Primary account of cardiac management and interventions in UK

Since the COVID lockdown period commenced in the UK from 23.3.2020, the primary intervention

Table 1. Causes of the reduction in PPCI for STEMI management and the increase in catheterization laboratory to treatment time

Causes of reduction in STEMI presentation	<ul style="list-style-type: none"> • Patients afraid of catching COVID-19 when entering hospital • Lower smoking rates • Lower physical activity due to lockdowns • Strict lockdown rules deter patients from leaving house • Misinterpretation of cardiac pain for respiratory causes • Lower air pollution
Causes of delays in STEMI management	<ul style="list-style-type: none"> • Limited hospital staff due to COVID-19 illness or overload • Hospital staff take time to don PPE • Long screening times for COVID-19

Abbreviations: PPCI = Primary percutaneous coronary intervention; STEMI = ST elevation myocardial infarction; PPE = Personal protective equipment

and activities of the cardiology department have been significantly affected. This period has been associated with centralization of procedures so that the focus can be made on maximizing our efforts to support COVID patients. Elective coronary angiograms have been cancelled due to the risk of acquiring COVID and further lack of elective cardiac surgery operations within the department due to prioritizing only emergency and urgent cases with severe, critical coronary diseases with acute presentations.

The presentation of PPCI through emergency cardiology services has been affected, nevertheless there is continued service provision. In some regions, there is even reduction in emergency primary PCI presentation by more than half when comparing to pre-lockdown era. There is no clear explanation for such a drastic drop especially with centralization of services; one could state that atypical presentations in elderly patients are leading them to be reluctant to call emergency services for their unusual symptoms such as epigastric pain, shoulder/arm or jaw pain. However, the ongoing COVID study in the region will analyse such factors and give more clarity on the reasons behind this and outcomes in those backlogged elective coronary angiograms.

Impact of COVID-19 on cardiovascular surgery

In addition to treating primary cardiac patients, it is becoming increasingly important to monitor the cardiovascular implications of COVID-19 and appropriate allocation of scarce resources. It was found that 15% of COVID-19 patients have underlying cardiovascular disease and it is a risk factor for developing adverse complications such as ACS if they contract the virus (8,9). COVID-19 infection can also trigger direct myocardial injury and cytokine storm which may lead to heart failure, arrhythmias and myocardial infarction (10).

As the situation is rapidly evolving globally, it may be difficult to provide practice recommendations for cardiology services. Several recommendations have been proposed; outpatients who are asymptomatic and stable will have their treatment deferred, while unstable patients with conditions such as ascending aortic

dissections, ACS and symptomatic aortic stenosis, who cannot be discharged safely should be cared for following usual guidelines as far as possible (11). Postponing rather than cancelling elective procedures is generally recommended to sustain healthcare services and to reduce patient exposure to the high volume of COVID-19 patients in hospitals. However, there is a need to be wary of significant increase in morbidity in lengthy postponements of a few months (12). Indeed, the British Cardiovascular Intervention Society (BCIS) provided guidelines stating that with the national PPCI programme, this service should be maintained the standard care for STEMI and implemented as efficiently as possible (13). Ultimately, a decision has to be made based on hospital staff capacity, ICU beds available, ventilators, ECMO machines and blood products. Another challenge is the shortage of personal protection equipment (PPE) and it has been suggested that masks can be sterilised and reused (14). Surgical staff have to wear extra bulky protective gear which may pose as a challenge to some, interfering with the level of care as a result. Early discharge of patients should also be considered, together with monitoring of their conditions post treatment via telemetry (11).

Additionally, pre-operative screening for COVID-19 is recommended even for asymptomatic patients (15). Presentations of COVID-19 are variable and infected patients may be unaware of their disease and may not alert medical staff about non-specific symptoms they are experiencing. In addition to donning PPE, it is also proposed that hospital staff split into smaller work groups (16). If quarantine is needed, only the individual group will have to stop work and there is no need for the whole unit to close. Handling of airway and oesophagus pose a high risk of aerosolization of virus particles increasing the risk of inhalation of COVID-19. As such, N95 masks are recommended especially when attending to patients undergoing urgent cardiac surgery (17,18).

Future Studies

In the current standing of the majority of elective surgeries, their cancellation places patients at home. However, it was estimated that more than 50% of elec-

tive surgical cases could progress to a worsening physiological condition (19). This postponement could lead to extended low quality of life, exacerbating symptoms and even the presentation of atypical symptoms that patients may not be aware of (1). Furthermore, such a delay could create stigma and fear in patients, which can be damaging for their mental wellbeing (20).

Indeed, the COVID-19 outbreak will have a drastic effect beyond the infected and it will become vital to monitor the conditions and management of patients with delayed PPCI. In particular vulnerable groups such as diabetic, elderly and chronic patients as well as those with previous cardiac surgeries and renal failure may face additional complications that will need to be addressed. In light of this, it becomes increasingly important to strategize a risk stratification system in order to identify patients that may be in need of urgent intervention after delay. A paper published in the United States proposed a scoring system for elective surgeries, after a blanket cancellation order was submitted by the American College of Surgeons (ACS). It was suggested that cardiovascular procedures have an urgency of 2 weeks (19). Adapting and implementing such a system to elective cardiac surgeries could assist in determining the urgency of cases and ensuring patient safety.

At the same time, simple monitoring of patients through means of telemedicine can help keep track of their progression. A study conducted to evaluate the use of a handheld ECG in India found it to be valuable in monitoring heart disease for remote use (21). Such technology could be valuable for use with high risk patients and can allow for immediate action to prevent patients going into cardiac arrest at home or in transit to their local Accident and Emergency (22). Future studies could evaluate the long-term effects of delaying these procedures and could examine the best methodology to prevent casualties. This would stand as a separate investigation to hospital care and mortality and morbidity as a direct result of contracting COVID-19.

Conclusion

COVID-19 has had an enormous impact on healthcare provision around the world, not only

for those who are infected but also for those with ACS. There will also be dire implications of a rebound in surgical cases due to the backlog. A risk-stratification method could be proposed to allow for more strategic allocation and schedule for treatments to prevent further casualties in patients with cardiovascular disease. Ultimately, it will be necessary to follow patients closely after this pandemic to evaluate the long term impact on overall patient health.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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