

The missing acute coronary syndromes in the COVID-19 era

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Ther Adv Cardiovasc Dis

2020, Vol. 14: 1–5

DOI: 10.1177/
1753944720977732

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Abstract

Aims: To determine whether the number of patients presenting with acute coronary syndromes has reduced during the COVID-19 pandemic.

Methods: Numbers of primary percutaneous coronary intervention (PPCI) activations, ST elevation myocardial infarctions (STEMIs) and non-ST elevation myocardial infarctions (NSTEMIs) in a large tertiary Greater London centre and a large district general hospital, both of which have on-site heart attack centres, were collected. We compared the number of PPCI activations, STEMI, NSTEMIs and all MIs prior to the COVID-19 era (January to third week of February 2020), after the start of some COVID-19 restrictions taking place (fourth week of February 2020) and after formal instruction by the United Kingdom Government that all citizens were to observe strict social distancing measures (20 March 2020). We further obtained data for the corresponding weekly figures from 2019.

Results: The average weekly figure of all myocardial infarction in 2020, prior to the COVID-19 social distancing restrictions/awareness in the UK (beginning of January to third week of February), did not differ when compared with corresponding weeks in 2019 (23.3 ± 5.4 in 2019 versus 21.13 ± 3.5 , $p=0.411$).

With increased media reporting and associated public awareness of the threat of COVID-19 (last week of February), there was a significant reduction in all myocardial infarction (27.1 ± 4.7 in 2019 versus 15.9 ± 3.6 in 2020, $p < 0.001$). Following official governmental instruction that mandated strict social distancing and the 'stay at home' campaign, the weekly figures of STEMI (15 ± 3.5 in 2019 versus 10 ± 4.4 in 2020, $p=0.013$), NSTEMI (13 ± 2.6 in 2019 versus 4.7 ± 2.3 in 2020, $p=0.038$) and all myocardial infarction (28 ± 6.1 in 2019 versus 14.7 ± 5.7 in 2020, $p=0.008$) have remained significantly reduced.

Conclusion: We have observed an unexpected major decline in presentations (and treatment) of the entire spectrum of acute coronary syndromes following the beginning of the COVID-19 pandemic and nationwide public-health measures that have promoted the importance of strict social distancing and self-quarantine.

Keywords: COVID-19, acute coronary syndrome, NSTEMI, STEMI, myocardial infarction

Introduction

In December 2019, an outbreak of a novel coronavirus (COVID-19) was first reported in Wuhan, Hubei province, China¹ and since has spread rapidly throughout the world. The virus itself is highly contagious and in a significant minority results in acute respiratory failure and associated mortality.² This has resulted in a significant strain on healthcare systems worldwide due to a number of factors, including a huge influx of patients, resource utilization and non-availability of equipment and potential risks of exposure for staff and

other patients. Government strategy has, as a consequence, been focused upon public education and policies including social distancing to reduce the numbers of patients infected whilst at the same time expanding critical care capacity and moving resources from elective care to emergency care. At the same time, significant resource has been deployed to maintain emergency care pathways for non-COVID-19 related illnesses.³

With regard to the management of cardiovascular disease, acute patient pathways particularly

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relating to the management of acute coronary syndrome have been the focus of much attention, with every effort made to maintain the current excellent care afforded to these patients with predominantly percutaneous coronary intervention (PCI) but also coronary artery bypass grafting when deemed appropriate by the heart team.^{4,5} In addition, there have been a number of alternative pathways suggested in the COVID-19 era if this gold standard treatment cannot be delivered by utilizing lytic agents;⁶ however, most cardiac societies have condemned these as “last resort strategies” which are certainly inferior to primary PCI.

However, in spite of the effort in maintaining acute coronary syndrome pathways and contingency planning, anecdotally, we and others have noted a reduction in the number of patients presenting with acute coronary syndromes.⁷ The aim of this study was therefore to objectively determine whether this indeed is the case.

Methods

In the current study we collected numbers of primary PCI (PPCI) activations, ST elevation myocardial infarctions (STEMIs) and non-ST elevation myocardial infarctions (NSTEMIs) in a large tertiary Greater London centre (Harefield Hospital, Royal Brompton and Harefield NHS Foundation Trust) and a large district general hospital (Royal Berkshire Hospital, Royal Berkshire NHS Foundation Trust), both of which have on-site heart attack centres. Harefield Hospital has a PPCI catchment population of nearly 2.5 million, averaging 700 STEMIs and 400 NSTEMIs a year. The Royal Berkshire Hospital is a smaller regional hospital with a PPCI catchment population of 750,000 with an average of 200 STEMIs and 250 NSTEMIs a year.

We compared the number of PPCI activations, STEMI, NSTEMIs and all myocardial infarctions (MIs) prior to the COVID-19 era (beginning of January to third week of February 2020), after the start of some COVID-19 restrictions taking place (fourth week of February 2020) and after formal instruction by the United Kingdom Government that all citizens are to observe strict social distancing measures (20 March 2020). We further obtained data for the corresponding weekly figures from 2019. Anonymised data was obtained from dedicated institution-specific cardiac databases. Ethics approval was not required for a study of this nature from the respective institutions.

Statistics

All continuous variables were tested for normality using the Kolmogorov–Smirnov test. Data are presented as percentages, mean \pm standard deviation (SD), or median (interquartile range). Differences in proportions were tested with the Chi-square test or Fisher exact test, and differences in continuous variables were tested with a Student's *t*-test or Wilcoxon rank sum test for parametric and non-parametric variables, respectively. Differences in weekly rates of PPCI activations, STEMIs, NSTEMIs and all MIs were compared using paired *t*-test. A *p* value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS 26 (SPSS 26, IBM Corp.: Armonk, NY, USA).

Results

From the first week of January 2020 up until the end of the second week of April 2020 a total of 405 PPCI activations, 183 STEMIs and 97 NSTEMIs (total myocardial infarctions: 280) were recorded across the two hospitals. Corresponding figures for 2019 were 509 PPCI activations, 241 STEMIs and 135 NSTEMIs (total myocardial infarctions: 376) (Figure 1). Patient demographic data for patients from both 2019 and 2020 diagnosed with a definitive diagnosis of an acute coronary syndrome are summarised in Table 1.

The average weekly figure of STEMIs in 2020 prior to the COVID-19 social distancing restrictions/awareness in the UK (January to third week of February) was 13.9 ± 2.9 , which was comparable to the 2019 average of 15.2 ± 3.5 in the corresponding time frame ($p = 0.410$). Similarly, weekly figures of NSTEMIs (8 ± 3.2 in 2019 *versus* 7.25 ± 2.86 in 2020, $p = 0.664$) and indeed all MIs (23.3 ± 5.4 in 2019 *versus* 21.13 ± 3.5 in 2020, $p = 0.411$) did not differ (Figure 2).

With increased media reporting and associated public awareness of the threat of COVID-19 (last week of February), the weekly figures of STEMI (17.0 ± 3.6 in 2019 *versus* 10.3 ± 3.0 in 2020, $p = 0.002$), NSTEMI (10.1 ± 3.4 in 2019 *versus* 5.6 ± 1.7 in 2020, $p = 0.033$) and all MI (27.1 ± 4.7 in 2019 *versus* 15.9 ± 3.6 in 2020, $p < 0.001$) significantly reduced (Figure 2).

Following official governmental instruction that mandated strict social distancing and the “stay at home” campaign, the weekly figures of STEMI

(15 ± 3.5 in 2019 *versus* 10 ± 4.4 in 2020, $p=0.013$), NSTEMI (13 ± 2.6 in 2019 *versus* 4.7 ± 2.3 in 2020, $p=0.038$) and all MIs (28 ± 6.1 in 2019 *versus* 14.7 ± 5.7 in 2020, $p=0.008$) have remained significantly reduced (Figure 2).

Discussion

The main finding of our retrospective observational study is an unexpected major decline in presentations (and treatment) of the entire spectrum of acute coronary syndromes following the beginning of the COVID-19 pandemic and nationwide public-health measures that have promoted the importance of strict social distancing and self-quarantine. These findings appear to be true for both a larger tertiary referral and smaller district regional centre and support other observational published data from the United Kingdom,⁸ the

Table 1. Patient demographics.

Variable	2019 (n=376)	2020 (n=280)
Male	259 (68.9%)	183 (65.3%)
Caucasian	231 (61.4%)	166 (59.2%)
Age, years \pm SD	73.2 \pm 8.1	75.4 \pm 6.9
Diabetes mellitus	107 (28.6%)	85 (30.4%)
Smoking	112 (29.8%)	73 (26.1%)
Renal failure	32 (8.5%)	19 (6.8%)
Previous stroke	21 (5.6%)	16 (5.7%)
Previous PCI	70 (18.6%)	58 (20.7%)
Previous CABG	17 (4.5%)	11 (3.9%)

CABG, coronary artery bypass graft; PCI, percutaneous coronary intervention.



Figure 1. Comparison of acute coronary syndrome presentations in 2019 and 2020. MI, myocardial infarction; NSTEMI, non-ST elevation myocardial infarction; STEMI, ST elevation myocardial infarction.

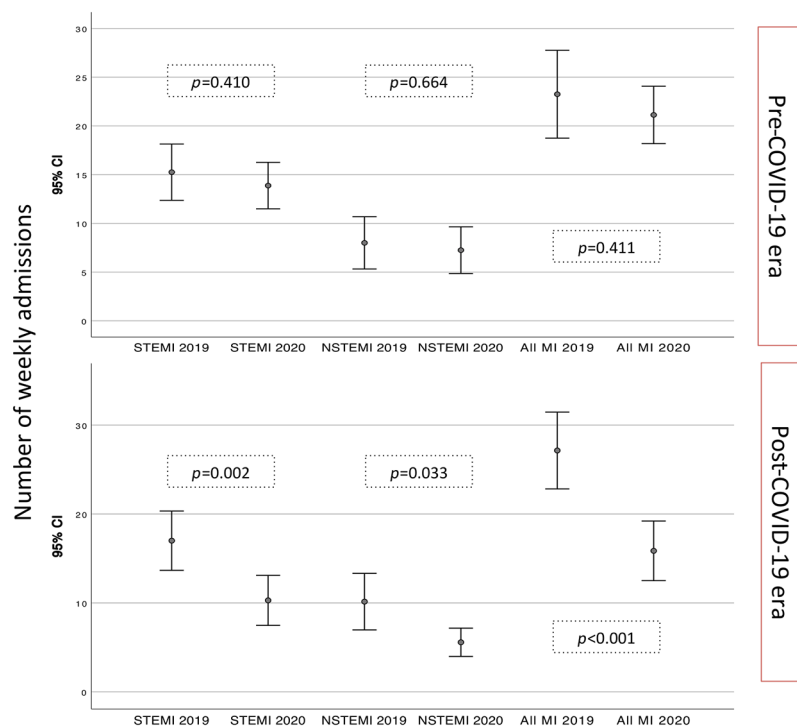


Figure 2. Comparison of acute coronary syndrome presentations in the pre- and post-COVID-19 eras.

CI, confidence interval; MI, myocardial infarction; NSTEMI, non-ST elevation myocardial infarction; STEMI, ST elevation myocardial infarction.

United States of America⁹ and Europe (Austria),⁷ suggesting an approximately 50% reduction in patients presenting with an acute coronary syndrome during the COVID-19 pandemic when compared with the corresponding weeks the previous year.

These findings are unexpected and are likely due to a number of reasons. An unintended consequence of current governmental policy that has focussed upon strict social distancing measures may be that patients may be worried about seeking help from emergency services due to concern over contracting COVID-19 when leaving their houses or that they are being a 'burden' at a time when the health service is already stretched.

Similarly, with the focus on COVID 19 public awareness, and lack of education and symptom campaigns for other life-threatening pathologies (e.g. MI, stroke), individuals may be mis-interpreting symptoms of chest pain and breathlessness as respiratory in aetiology, or even dismissing stroke warning symptoms, again

resulting in individuals not seeking emergency help.

There may also be other explanations for a reduction in patients presenting with acute coronary syndromes, by virtue of this being a true representation of a reduction in this pathology. With the country on 'lockdown', individuals have been forced to stay at home thereby removing certain stressors in their lives, including commuting and face-to-face meetings,¹⁰ which are well described triggers of acute MI. Further, this may have promoted a healthier lifestyle with improved sleep, diet and exercise.¹¹ Finally, short- and long-term exposure to fine particulate matter air pollution is an important environmental risk factor for cardiovascular disease in general but specifically acute MI.¹² With non-essential travel currently banned in the midst of the current COVID-19 pandemic, pollution has significantly reduced, as has individual exposure, again possibly contributing to the observed significant reduction in acute coronary syndrome presentations.

Regardless of the possible explanation of our observations, the large reduction in the number of patients presenting with acute coronary syndromes is a worrying trend and is likely to be associated with a significant increase in early and late infarct-related morbidity and mortality. Whilst it is correct that healthcare systems and governmental policy should focus upon the acute care of COVID-19 patients, it is critical that other pathologies are not overlooked or forgotten. There should be increased public awareness that whilst social distancing remains, patients should not ignore symptoms of acute MI and they should seek emergency help: this should be a priority for public health campaigns moving forward during these unprecedented and challenging times.

Limitations

These are retrospective observational data limited to only two heart attack centres. Our study does not provide data with regard to mortality.

Acknowledgements

We would like to acknowledge the cardiology departments at both the Royal Berkshire Hospital and the Harefield Hospital for their efforts in the management of all patients presenting with acute coronary syndromes.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest statement

The authors declare that there is no conflict of interest.

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