European Heart Journal (2023) 44 (Suppl 2)
Coronary Artery Disease (Chronic) / Chronic Coronary Syndromes (CCS) – Pathophysiology and Mechanisms, Inflammation and Immunity

Prior COVID-19 infection is associated with persistent and higher thrombus burden in acute coronary syndromes

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Funding Acknowledgements: Type of funding sources: Public grant(s) – National budget only. Main funding source(s): This work was part funded by King's College Hospital R&D Grant and was supported by the Department of Health via a National Institute for Health Research Biomedical Research Centre award to Guy's & St Thomas' NHS Foundation Trust in partnership with King's College London and King's College Hospital NHS Foundation Trust. AMS is supported by the British Heart Foundation.

Background/Introduction: The COVID-19 pandemic challenged global healthcare systems by causing a multi-organ syndrome with a high mortality rate. COVID-19 infection is associated with a profound inflammatory response and hypercoagulability in the acute phase, however little is known on the persistence of endothelial dysfunction and hypercoagulability beyond this phase and its impact on acute coronary syndrome (ACS).

Purpose: The purpose of this study was to investigate the effects of COVID-19 infection on the presentation and outcomes of coronary artery disease in patients with ACS.

Methods: A single centre prospective observational study was conducted from 10th of June 2020 to 6th of May 2021. Patients aged 18 or over presenting with ACS were included. Participants were excluded if they had active COVID-19 infection or if they did not undergo coronary angiography on admission.

Study participants were tested one presentation for SARS-CoV-2 nucleoprotein (N) antibody and SARS-CoV-2 spike protein receptor binding domain (RBD) antibody to determine whether the participants had prior COVID-19 infection, COVID-19 vaccination, or neither at the time of their presentation. Data was collected on their baseline demographics, angiographic findings, and treatments. Patients were followed up via telephone call and electronic case record review to assess outcomes at one year.

The primary end-point was all-cause mortality. Pre-specified secondary endpoints were cerebral infarction, repeat myocardial infarction or unplanned revascularisation and death (MACE) at one year, coronary artery ectasia, presence of thrombus, and thrombectomy requirement.

Results: 280 patients were approached for the study. 5 refused participation, 8 were lost to follow-up, 2 did not undergo coronary angiography, and 98 had uninterpretable/insufficient blood samples for antibody analysis.

The remaining study population had 167 patients (median age 64 [43-85], 69.5% male). 22 (13.1%) had prior infection, 76 (45.5%) were antibody negative and 69 (41.3%) had a post COVID-19 immunisation response. 31.7% had diabetes mellitus, and 49.7% were smokers.

There was no difference in the primary endpoint between the groups. Patients with prior COVID-19 infection were more likely to have coronary ectasia/aneurysm compared to vaccinated and antibody negative patients (57.1% vs 27.5% and 30.3%, respectively $p = 0.034$). They were also more likely to have thrombosis (61.9% vs 33.3% and 52.6%, $p = 0.019$), and undergo thrombectomy (19.0% vs 4.3% and 3.9%, $p=0.027$).

Conclusions and Relevance: Our findings suggest that COVID-19 infection may lead to persistent endothelial dysfunction and hypercoagulability, portending increased severity of coronary artery ectasia and coronary thrombosis even after recovery from the initial infection.

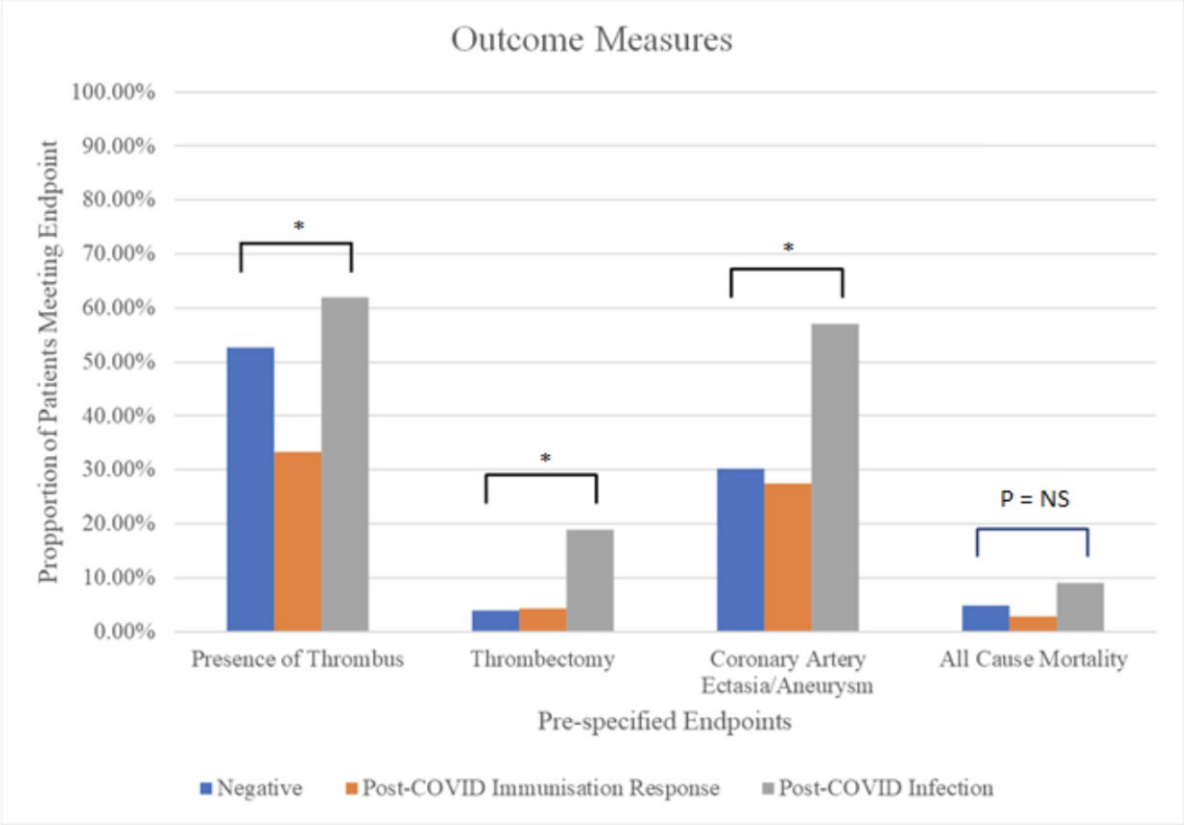
Table 1: Outcome measures categorised by patient groupings.

	All N = 167	Negative N = 76	Post-COVID immunisation response N = 69	Post-COVID infection N = 22	Significance
Number of vessels involved *(median ± IQR)*	2.0 ± 1.0 n = 165	2.0 ± 1.0 n = 75	2.0 ± 1.0 n = 69	2.0 ± 1.0 n = 21	P = 0.680 [a]
Coronary ectasia / aneurysm *(%; n)*	32.5% 54/166	30.3% 23/76	27.5% 19/69	57.1% 12/21	P = 0.034 [b]
Thrombectomy *(%; n)*	6.4% 10/156	3.9% 3/76	4.3% 3/69	19.0% 4/21	P = 0.027 [b]
Presence of Thrombus *(%; n)*	45.8% 76/166	52.6% 40/76	33.3% 23/69	61.9% 13/21	P = 0.019 [b]
Treatment for slow reflow *(%; n)*	3.6% 6/166	0.0% 0/76	5.8% 4/69	9.5% 2/21	P = 0.052 [b]
STEMI (%; n)	37.5% 63/168	35.5% 27/76	35.7% 25/70	50.0% 11/22	P = 0.981 [b]
Inpatient stay in days *(median ± IQR)*	4.0 ± 5.0 n = 165	4.0 ± 5.0 n = 75	4.0 ± 5.0 n = 69	3.0 ±2.0 n = 21	P = 0.417 [a]
Alive at discharge *(%; n)*	98.1% 151/154	97.0% 64/66	98.6% 68/69	100.0% 19/19	P = 0.647 [b]
Stroke at 1 year *(%; n)*	1.8% 3/167	2.6% 2/76	1.4% 1/69	0.0% 0/22	P = 0.687 [b]
Repeat angiography at 1 year *(%; n)*	9.0% 15/167	13.2% 10/76	4.3% 3/69	9.1% 2/22	P = 0.180 [b]
Repeat MI at 1 year *(%; n)*	2.4% 4/167	1.3% 1/76	1.4% 1/69	9.1% 2/22	P = 0.088 [b]
Mortality at 1 year *(%; n)*	6.6% 11/167	10.5% 8/76	2.9% 2/69	4.5% 1/22	P = 0.166 [b]

a: Kruskal-Wallis test

b: Pearson Chi-Square test

Figure 1: Graph of outcome measures categorised by patient groupings.



*: Results achieved statistical significance by Pearson Chi-Square test