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Outcomes of patients diagnosed with COVID-19 in the early postoperative period following cardiac surgery

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Abstract

The coronavirus 2019 (COVID-19) pandemic has disrupted patient care across the NHS. Following the suspension of elective surgery, priority was placed in providing urgent and emergency surgery for patients with no alternative treatment. We aim to assess the outcomes of patients undergoing cardiac surgery who have COVID-19 infection diagnosed in the early postoperative period. We identified 9 patients who developed COVID-19 infection following cardiac surgery. These patients had a significant length of hospital stay and extremely poor outcomes with mortality of 44%. In conclusion, the outcome of cardiac surgical patients who contracted COVID-19 infection perioperatively is extremely poor. In order to offer cardiac surgery, units must implement rigorous protocols aimed at maintaining a COVID-19 protective environment to minimize additional life-threatening complications related to this virus infection.

Keywords: Cardiac Surgery • Outcomes • COVID-19

INTRODUCTION

The coronavirus 2019 (COVID-19) pandemic has disrupted patient care across the NHS. Following the suspension of elective surgery, priority was placed in providing urgent and emergency surgery for patients with no alternative treatment.

The pandemic has caused significant morbidity and mortality to the general population [1]. Furthermore, the outcome of patients undergoing thoracic surgery and major abdominal surgery is known to be poor [2–4]. Although routine cardiac surgery comes with a low risk, it does require a hospital stay of ~5–7 days including time in intensive care and on a ventilator. Developing COVID-19 infection perioperatively would likely increase the morbidity and mortality above and beyond associated with surgery. However, the outcomes of patients developing COVID-19 in cardiac surgery patients during their hospital stay are unknown.

We aim to assess the outcomes of patients undergoing cardiac surgery who have COVID-19 infection diagnosed in the early postoperative period.

PATIENTS AND METHODS

All patients undergoing elective or urgent cardiac surgery at St Bartholomew's Hospital from 1 March to 27 March 2020 were included in this study. They were identified from a national cardiac surgery database. This time period was prior to routine COVID-19 screening. Patients diagnosed with COVID-19

infection via positive throat swab taken due to clinical suspicion postoperatively were reviewed. Data from electronic patient records collected contemporaneously were reviewed retrospectively and presented.

RESULTS

During the study period, we performed 97 cardiac surgical procedures. Seven patients were diagnosed with COVID-19 infection in the immediate postoperative period. Mean age was 59 (21–73) years, all patients were male and the majority of operations were performed on an urgent basis with one done electively. Mean EuroSCORE II was 2.06 (0.77–7.43). For the urgent cases, the mean length of hospital stay preoperatively was 12 (4–22) days. The majority of this time was in the referring general hospital (Table 1).

Procedures were coronary artery bypass grafts (CABG) $n=4$, aortic valve replacement $n=1$, aortic valve replacement + CABG $n=1$ and mitral valve replacement + CABG $n=1$. Mean bypass time was 111 min (77–173) and cross-clamp time 89 min (37–144). There were no re-sternotomy for bleeding, no stroke and no renal replacement therapy.

COVID-19 diagnosis was made on postoperative day 1, day 2, day 3 ($\times 2$), day 8 ($\times 2$) and day 9. Note the day 1 diagnosis was following a negative swab 2 days previously.

There were a variety of presentations at the time of diagnosis. On the day of diagnosis, 4 patients were pyrexial, 1 patient had raised white cell count, 6 patients had raised CRP, 3 patients had

Table 1: Demographics and outcomes of patients diagnosed with COVID-19 in the postoperative period

Patient	Male/female	Age	Preoperative length of stay	Euro SCORE II	Elective/urgent	Operation	Bypass/cross-clamp	Day of COVID diagnosis	Outcome	Time to outcome
1	Male	62	18	2.5	Urgent	CABG	75/96	3	Died	4
2	Male	56	1	1.03	Elective	CABG	77/86	8	Home	14
3	Male	21	4	0.77	Urgent	AVR	70/92	9	Home	12
4	Male	73	6	7.43	Urgent	MVR + CABG	144/173	8	Died	16
5	Male	72	22	2.97	Urgent	AVR + CABG	133/152	3	Died	11
6	Male	57	5	0.88	Urgent	CABG	84/104	4	Home	6
7	Male	71	16	1.26	Urgent	CABG	37/77	1	Home	16
8	Male	59	23	2.29	Urgent	MVR	84/101	23	Home	7
9	Female	79	1	4.91	Elective	MVR + TVR	73/123	37	Died	2

AVR: aortic valve replacement; CABG: coronary artery bypass grafts; COVID-19: coronavirus 2019; MVR: mitral valve replacement; TVR: tricuspid valve repair.

Table 2: Clinical features on the day of COVID-19 diagnosis

Patient	Day of COVID diagnosis	Outcome	Pyrexia	Raised WCC	Lymphopenia	Raised CRP	CXR changes
1	3	Died	38.4	No	Yes	Yes	Yes
2	8	Home	38	Yes	No	Yes	No
3	9	Home	38.5	No	No	Yes	No
4	8	Died	36.9	No	Yes	Yes	No
5	3	Died	36.7	No	Yes	Yes	Yes
6	4	Home	38.1	No	No	Yes	Yes
7	1	Home	36.5	No	No	No	Yes
8	23	Home	38.6	No	Yes	No	No
9	37	Died	?	Yes	No	Yes	Yes

COVID-19: coronavirus 2019; CRP: c-reactive protein; CXR: chest x-ray; WCC: white cell count.

lymphopenia and 4 patients had CXR changes consistent with COVID-19.

Mortality was $n = 3$ (43%) whilst the other 4 patients were discharged home well. Of the 3 patients who died, time from diagnosis to death was 4, 13 and 16 days. All 3 died from respiratory failure, refractory to medical management. One patient had additional renal failure.

In addition, there were 2 patients, operated on previously but remained inpatients during the study period, with a late diagnosis. Mean age was 60 years (59–79), one was male and the other, female. Mean EuroSCORE was 3.6% (2.29–4.91). Their operations were urgent mitral valve replacement and elective mitral valve replacement plus tricuspid valve repair. Time from surgery until diagnosis was 23 and 39 days. One patient died 2 days following diagnosis from respiratory failure and systemic sepsis, the other was discharged home 7 days following diagnosis (Table 2).

All patients discharged home were alive and well at 4-week follow-up.

DISCUSSION

COVID-19 is a respiratory disease caused by the novel corona virus. It is highly contagious and causes severe respiratory failure, mainly in people with comorbid conditions. It has an asymptomatic incubation period of 5–14 days [1].

COVID-19 infection following cardiac surgery is associated with very poor outcomes and in our series of 9 patients, a

mortality of 44%. During the same period, our mortality was 5.5% for patients not identified as having COVID-19 infection.

During the period in which these patients were operated on, there was no established COVID-19 screening protocol preoperatively or postoperatively. Only one patient (patient 7) had a preoperative swab, which was negative. However, a second swab on the day of the operation came back as positive the following day. For those patients who developed COVID-19 in the early postoperative period, it is likely that they contracted the virus preoperatively, either prior to admission or whilst in hospital. However, the clinical manifestations only appeared in the postoperative period. We have shown a widely variable presentation in those patients testing positive. It is unclear as regards the contribution of cardiopulmonary bypass, postoperative ventilation and obvious cardiac comorbidities to the outcomes in these patients. However, the outcomes were very poor, even for this patient population requiring urgent major cardiac surgery. Furthermore, the hospital stay for these patients is significantly longer than that expected for routine elective and urgent cardiac surgery.

The cause of death in all 4 of our patients was respiratory failure with 1 concomitant renal failure. We did not see thrombosis in any patients which has been seen in other series of COVID-19 infection.

Those patients who were diagnosed late in their hospital stay most likely contracted the virus whilst in hospital. It is impossible to determine the source, but it could be hypothesized that it originated from asymptomatic patients, staff members or visitors. Without routine screening of staff or patients at this time, such transmission is likely and the incidence of this unknown.

During the COVID-19 pandemic, despite the cancellation of all elective operations, there is a need to maintain urgent and time-critical emergency cardiac surgical services. As part of the Pan London Emergency Cardiac Surgery (PLECS) system, our institution and one other were tasked with providing this service for the 7 usual providers across London. We aim to provide this care in a COVID-19 protective environment to prevent the poor outcomes seen in this patient series. This will remain important during resumption and recovery of elective surgical activity.

We have instituted local protocols aimed at thorough screening of all patients before and on arrival in our unit to ensure that we do not admit or operate on anyone with the virus and isolating patients with unknown COVID-19 status. Our screening protocol has been published previously [5] and consists of 2 throat swabs, lymphocyte count, LDH and ferritin levels and a computed tomography chest. Furthermore, all patients have bronchoalveolar lavage for viral testing at the time of intubation in operating theatre. In line with Public Health England guidance, all surgeries are now performed with full personal protection equipment and patients are cared for in critical care with staff wearing full personal protection equipment. We minimize staff movement through clinical areas and interaction with patients. On the ward setting, staff wear face masks, apron and gloves. We have also banned visitors in order to reduce transmission.

Our observations are limited by the lack of routine testing of all patients for COVID-19 infection; therefore, the infection rate may be higher; however, poor outcomes appear to be in those patients who show signs of infection.

CONCLUSION

In conclusion, the outcome of cardiac surgical patients who contracted COVID-19 infection perioperatively is extremely poor. In order to offer emergency and time-critical urgent cardiac surgery, units must implement rigorous protocols aimed at maintaining a

COVID-19 protective environment to minimize additional life-threatening complications related to this virus infection.

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