Increased Mortality in COVID-19 Patients Following Cardiac Surgery

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Abstract

In this report we describe the clinical presentation, laboratory findings and outcomes of four patients that were referred for urgent cardiothoracic intervention and tested positive for COVID-19. Though the majority of the patients undergoing surgery had low Society of Thoracic Surgeons score and uneventful operating time, mortality was very high and driven primarily by the viral syndrome. Laboratory markers that have been associated with disease severity in the general population were also prognostic in our population. Our study shows that these patients have very high mortality, whereas prevention and preoperative screening is required in preventing nosocomial spreading of the disease.

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ABSTRACT

In this report we describe the clinical presentation, laboratory findings and outcomes of four patients that were referred for urgent cardiothoracic intervention and tested positive for COVID-19. Though the majority of the patients undergoing surgery had low Society of Thoracic Surgeons score and uneventful operating

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INTRODUCTION

Although the majority of elective surgical interventions have been postponed during the COVID-19 pandemic, many patients are referred to tertiary centers for emergent cardiothoracic interventions. To-date, data on the perioperative management of these patients are limited. Initial reports from Asia showed that patients with cardiovascular disease are increased risk for COVID-19 related mortality (1-2). In parallel, the majority of cardiothoracic patients presents with symptoms that resemble severe respiratory illness, posing a diagnostic challenge. Further, immune suppression due to cardiopulmonary bypass puts patients into high risk for complications. Finally, ethical challenges regarding cardiopulmonary resuscitation in the perioperative course often arise.

The expert society guidelines on optimization strategies for perioperative management of COVID-19 positive patients are underway. (3-4) Our study shows that cardiothoracic patients have very high mortality which is driven primarily by the viral infection, whereas prevention and preoperative screening is required for improving outcomes.

CASE DESCRIPTION

Case 1

An 83-year-old female with past medical history (PMH) significant for carotid artery disease s/p endarterectomy, stage IV chronic kidney disease and STS mortality score of 15.224% who presented with new onset lower back pain and SOB. The patient was found to have NSTEMI, and acute congestive heart failure (CHF). Decision was made to undergo coronary artery bypass graft (CABG) procedure of four vessels. On hospitalization day (HD) 8 during the cardiothoracic procedure, a nasopharyngeal swab for rapid SARS-CoV-2 PCR was performed and resulted positive. There were no intraoperative concerns. The separation from cardiopulmonary bypass (CPB) was uneventful. On postoperative day (POD)1 the patient was extubated. On POD2 patient complained for diffuse abdominal pain and developed leukocytosis, coagulopathy, lactic acidosis, transaminitis and acute renal failure requiring dialysis. Repeat TTE showed unchanged cardiac function and structure. Her course was complicated by multiple episodes of arrhythmias including atrial fibrillation and ventricular ectopies. On POD 3, Intra-aortic balloon pump was inserted with partial improvement of hemodynamic status. On POD 4 the patient suffered a cardiac arrest and got reintubated during ACLS. Palliative care was consulted and decision for comfort measures was made. The patient expired on POD 5.

Case 2

A 70-year-old male with PMHx of aortic stenosis s/p transaortic valve replacement, atrial fibrillation, complete heart block s/p pacemaker, CAD s/p CABG, chronic CHF and STS mortality score rate of 9.029% who presented with confusion and paralysis. MRI brain showed bilateral multiple small acute cerebral infarcts. Blood cultures were positive for gram-positive cocci in chains and pairs. A transthoracic echocardiogram showed severe aortic stenosis with an aortic root abscess and rocking bioprosthesis in the aortic position. His pacemaker was explanted. Chest x-ray was significant for pulmonary vascular congestion and patch bilateral airspace opacities. On HD 8 a screening test was positive. The patient was transferred to the ICU for subsequent medical management as a bridge therapy for aortic valve and aortic root replacement. The patient was experiencing chest pain during his ICU hospitalization and decision was made to proceed with the surgery due to the unstable valve. He did not have clinical signs of ARDS. The day of the surgery (HD 13), before coming to the operating room (OR), the patient developed pulseless ventricular fibrillation. The patient passed away within 30min from ACLS initiation.

Case 3

A 66-year-old male with PMH of hypertension, obstructive sleep apnea, diabetes mellitus, CHF, atrial fibrillation, alcohol abuse and STS mortality score rate of 2.708% who presented with progressively worsening SOB, chest pain, nonproductive cough, and lower extremity edema. On admission COVID-19 screening was negative. He was diagnosed with acute CHF. Echocardiogram showed an EF of 26% and cardiac angiogram revealed multivessel disease. The patient had on pump CABG x5 and left atrial appendage exclusion. Separation from CPB was uneventful and the ACT was zero. On POD 1 the patient had increased oxygen requirements. On POD 7 and HD 17 COVID-19 nasopharyngeal PCR was performed and was positive. On POD 15 he was re-intubated secondary to severe ARDS (PAO2/FIO2 ratio of 67.5), he developed severe hemodynamic instability, fever, and multiorgan failure. The patient expired on POD 35.

Case 4

A 46-year-old male without PMH who presented with acute chest and back pain radiating to the left lower extremity and diagnosed with Stanford type A aortic dissection. His STS mortality score was 2.575% with up to 17% 30 day mortality of the surgically corrected aortic dissection. Bilateral ground glass opacities where noted on preoperative CT scan. On admission, rapid COVID-19 PCR was positive. Emergent ascending aorta repair with tube graft was performed. Separation from CPB was uneventful and ACT was zero. The patient was transferred to the cardiothoracic ICU in stable condition and got extubated on POD1. On POD4 the patient became persistently febrile (Tmax:103 F) until POD14. Further infection workup was negative. The patient clinically improved and was discharged to a step-down surgical unit on POD 15.

SERUM MARKERS:

We followed the inflammatory markers and other serum markers that have been associated with disease severity and mortality. The results are presented in Figure 1.

CONCLUSION:

In this report, we describe our institution's experience with four patients that were tested positive for COVID-19 within the perioperative period. Although the patients' perioperative mortality rate was 2.575-17% and had an uneventful intraoperative course, three out of four patients expired secondary to causes attributed primarily to COVID-19 complications.

Interestingly, all patients presented with symptoms that were attributed to their cardiothoracic pathology. Screening during the perioperative surgery revealed the COVID-19 infection, providing further support to the Joint Statement guidelines (5). Although cancellation of the surgery due to the diagnosis of COVID-19 infection would not be always possible in our population, our experience suggests that it should affect the decision of postponing the procedure when possible.

Cardiothoracic patients are transferred to the ICU postoperatively, require intensive nursing care and many times develop arrhythmias that require advance cardiac life support (ACLS). These interactions can potentially result in high exposure of staff to COVID-19. In the reported cases, droplet precautions were not placed until after diagnosis, resulting up to a total of 408 hours of interactions without appropriate PPE. Furthermore, a dilemma that we faced was initiation of ACLS in cases that further interventions were considered futile.

Markers that have been associated with disease severity were applied to our population (2). We found that D-dimer and fibrinogen reached nadir on POD 3-5. After this timeframe, markers up-trended in patients that developed severe COVID-19 clinical syndrome. This observation suggests that D-dimer and fibrinogen can be used as surrogates of severe COVID-19 in this population.

The limitations of our study include the small sample size and the observational profile. Nevertheless, our experience identified several areas of quality improvement, and institutional screening practice changes. Further, our data support implementation of COVID-19 infection in the STS score for mortality assessment. Larger studies are needed to address mortality, prognostic markers, and peri-operative anticoagulation for COVID-19 cardiothoracic patients.

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