EDITORIAL

COVID-19: Don't Forget the Heart

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It is almost 2 years since the coronavirus disease-2019 (COVID-19) pandemic has been ravaging the world. A huge amount of medical data have been pouring in from across the globe. It has been already established that COVID-19 remains an unpredictable disease. Its spectrum stretches from asymptomatic or minimally symptomatic disease to acute respiratory distress syndrome, multiorgan failure, and death. People have been looking for tests that could predict the outcome of the patient early in the course of the disease. Of the many risk factors, the associated cardiac disease remains an important one. It has been noted that both associated coronary artery disease, as well as myocardial damage due to COVID infections, are independent risk factors for poor outcome.[1]

The association between COVID-19 disease and cardiac disease may be of various types. The number of patients having preexisting coronary artery disease is higher in proportion among COVID-19 patients, and this proportion is even higher among the COVID-19 patients who need intensive care or who ultimately die. The data from the National Health Commission of China showed that 17% of the COVID-19 patients had associated coronary artery disease. The second type is the direct injury of myocytes by the corona virus. The virus enters the heart by binding its spike proteins to the angiotensin-converting enzyme type II receptor, which are abundant in type II alveolar cells of the lung as well as in the myocytes. The other ways of myocardial injuries are severe hypoxemia when present, inherent hypercoagulable state of COVID-19 patients, side effects of some drugs, etc. In a series, the troponin was found elevated in 46% of COVID nonsurvivors as compared to only 1% of the survivors. Hence, cardiac involvement is associated with a worse outcome in the COVID-19 patients.[2]

With this background, a descriptive study of electrocardiographic changes in COVID-19 patients, by Drs Deepalaxmi, Kumar et al. lines up 315 patients of COVID-19, and compares their electrocardiograms (ECGs) on presentation. The clinical parameters of the patients, including symptoms, past medical history, the various parameters on presentation, and their course in the hospital were noted. Many of the patients were noncritical, as only about 20% needed intensive care unit (ICU) admission and 6% died. The associations between the ECG changes and clinical outcome were noted only in the following situations: "Ischemic changes" (which included ST depression, T wave changes, and ST elevation), were associated with either a history of hypertension or the presence of respiratory failure. These associations were statistically significant. The commonest ECG findings were left axis deviation, sinus tachycardia, poor R wave progression, and T wave inversion. The factors that may change the ECG readings like body mass index, electrolyte imbalances were not recorded. ECGs done prior to admission were also not recorded. Hence, it was not known whether the ECG changes were preexisting or they happened with the COVID infection. The markers of cardiac injury like the troponins were not recorded.

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As stated above, it has been noted that the COVID-19 has associations with cardiac diseases and associated cardiac pathology worsens the prognosis in COVID patients. Present severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has an overall lower rate of associated cardiovascular disease than 2002 SARS-CoV as well as MERS (Middle Eastern Respiratory Syndrome) epidemics, however, if we consider only the hospitalized patients the percentage of patients having associated cardiovascular disease is highest in the present SARS-CoV-2 epidemic.[3] ECG is a simple, inexpensive test and serves as an entrée in the cardiac workups. Hence, several researchers have studied the ECG changes in COVID patients. Some have collected the data on associated findings, notably cardiac troponin levels, while some have tried to find the prognostic value of the ECG findings.

The various ECG abnormalities associated with COVID-19 have been discussed in detail in a narrative review of the ECG findings in COVID-19 by Long et al. Atrial fibrillation has been a common arrhythmia, occurring in 10–22% of patients in different studies. Ventricular arrhythmias have been far less common but with a much worse prognosis. Some patients developed a Brugada syndrome-like pattern. QRS prolongation with or without a bundle branch block pattern has occurred in 12% of patients. The most common ECG abnormality after sinus tachycardia has been ST-segment depression or elevation. This in turn could be localized (occurring in a few leads) or more diffuse. This review puts the incidence of various ST-T changes in COVID-19 patients to about 40%. It is to be noted that the out of hospital cardiac arrests have increased in number from 2019 to 2020 in various studies in the USA, Italy, and France.[4]

Several studies have tried to record the ECG findings in hospitalized COVID patients. Some have tried to match the findings with disease severity. Some studies also have collected data on cardiac markers like cardiac Troponins and N terminal probrain natriuretic peptides. A study from Bologna looked into the ECGs on presentation and then ECGs done after 7 days, along with Cardiac Troponin levels. The parameters which predicted adverse

outcomes were primary ST-T changes (i.e., the changes which were not due to an associated bundle branch block pattern) and ECG evidence of left ventricular hypertrophy. ECG findings after 7 days which matched with adverse outcomes were an increase in the heart rate from the first ECG, new widening of the QRS, prolonged QT_c, etc. Elevated troponins also predicted an adverse outcome.[5] Another study from Rome looking into the ECG on the admission of 326 patients found heart rate, atrial fibrillation, ventricular arrhythmias, left bundle branch block pattern, ST-T changes, etc. all predict adverse outcomes after multivariate analysis prolonged QRS, left bundle branch block pattern, and any ECG abnormality all increased the risk of mortality.[6] Another multicenter retrospective trial looked into the ECGs of 431 patients who needed mechanical ventilation or died. Twenty-two percent had atrial fibrillation, 30% had features of acute right ventricular pressure overload 10% had classical $S_1Q_3T_3$ pattern, 41% had ST-T abnormalities of which 14% were thought to be having pathological T inversion. Prolonged QT was found in 38%. There was no difference in the incidence of right ventricle (RV) pressure overload pattern between ventilated and nonventilated patients. The authors concluded that most of the critically ill COVID-19 patients will have some of the ECG abnormalities mentioned above and such an ECG on presentation should warn us about poor outcomes.[7]

The problem with all these studies is that none of them has done other tests on these patients, like echocardiogram consistently. Some have noted cardiac markers like troponins. However, the cardiac markers themselves loose their specificity in COVID-19 patients with a state of acute inflammation. In fact, it has not been proven whether these ECG changes are just markers or a proof of myocardial damage specific to COVID. De Vita comparing the ECG findings of patients of COVID-19 acute respiratory distress syndrome (ARDS) and other viral ARDS could not show any difference in incidence or pattern.[8] Hence, there is no ECG change which is specific for COVID-19. The patterns of ECG abnormalities which predict adverse outcome also varies between studies. Chorin et al. found the best ECG finding to predict poor outcome was T wave abnormalities.[9] Another relatively large trial of 756 patients found atrial premature complexes, interventricular block, right bundle branch block, all predicted adverse outcomes.[10,11]

So we understand that many COVID-19 patients have some ECG abnormalities. These abnormalities do predict the seriousness of the disease and sometimes predict adverse outcomes. However, we do not know whether such ECG findings are just associated features or actually signs of COVID-19 induced damage to the heart. Neither do we have an ECG pattern specific for COVID-19. Perhaps more studies that will study serial ECGs along with other tests like echocardiograms and cardiac biomarkers will throw more light on these matters. The authors of our present study have pledged to extend their study to that effect. We will wait.

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