

Editorial

Assessing the Appropriateness and Effectiveness of Coronary CT Angiography in COVID-19 Patients with Chest Pain

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Coronary CT Angiography (CCTA) is well established for Chest Pain (CP) evaluation to assess coronary artery stenosis. However, the appropriateness of CCTA for COVID-19 patients with CP is unclear because a cardiac cause of CP in COVID-19 patients can be multifactorial, from direct viral myocardial injury to secondary hypercoagulability and to coronary stenosis [1]. The purpose of this report is to examine the appropriateness of CCTA for CP evaluation in laboratory confirmed COVID-19 patients.

We retrospectively reviewed consecutive COVID-19 patients with CP between March 7, 2020 and January 2021. COVID-19 diagnosis was confirmed using the Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) test (Cobas SARS-CoV-2, Roche, Indiana, USA and the Xpert Xpress SARS-CoV-2, Cepheid, California, USA). A waiver for individual consent was approved by the Institutional Review Board. Patient's demographic data, vital signs and ECG were charted prospectively in the CT reporting database. The laboratory results were retrospectively collected from the electronic medical records. The European Consortium clinical pre-test probability score for coronary artery disease was calculated based from the clinical criteria including age, sex, CP type, diabetes mellitus, smoking status, hypertension, and dyslipidemia [2] where the low pretest probability was defined as <5%, intermediate probability 5-70 % and high probability >70%. Patients less than 40 years old (N=3) were treated as if they were 40 years of age in order to calculate their score. The score was calculated to predict coronary stenosis >50% by CCTA, which was performed using a 320-detector CT (Acquilion One, Vision, Canon, USA) with prospective ECG gating.

Among 40 patients studied, 21 were female and the mean age was 53 years. Of those, 34 were hospitalized and 6 were outpatients. The patients' demographics are shown in the table. No patient was known to have pre-existing coronary artery disease. Based on the clinical criteria there were 11 patients having low pretest probability <5% and the remaining 29 having intermediate probability ranging from 5% to 47%. None had high pretest probability. All patient had 12-lead ECG prior to CCTA. ST/T wave abnormalities were found in 14 (35%) and Q wave abnormality in 5 (13%) patients. Of the 32 patients who had

Table 1: Demographics (N=40).

| | N(%, Mean (SD)) |
|---|-----------------|
| Age (years) | 53 (9) |
| Male | 19 (48) |
| Body mass index (km/m ²) | 31 (7) |
| Comorbidities | |
| Hypertension | 16 (40) |
| Diabetes | 8 (20) |
| Hyperlipidemia | 13 (33) |
| Ever smoking | 11 (28) |
| Family History of Premature coronary artery disease | 7 (18) |
| Vital signs | |
| Heart rate (BPM) | 73 (14) |
| Blood pressure, systolic (mmHg) | 128 (17) |
| Blood pressure, diastolic (mmHg) | 75 (11) |
| Troponin elevation (N=32) | 1 (3) |
| ST-T wave abnormality | 14 (35) |
| Q wave abnormality | 5 (13) |
| Coronary calcium score (CAC) (N=38) | |
| CAC=0 | 23 (61) |
| 0< CAC <100 | 7 (18) |
| CAC >400 | 2 (5) |
| Coronary CT angiography (CCTA) | |
| Normal | 20 (50) |
| 0<coronary stenosis ≤50% | 12 (30) |
| Coronary stenosis >50% | 8 (20) |
| European Consortium Pre-test Probably Score | |
| Low pretest probability (<5%) (N=11) | |
| Normal CCTA | 8 (73) |
| Coronary stenosis ≤50% | 3 (27) |
| Coronary stenosis >50% | 0 (0) |
| Intermediate probability (5-70 %) (N=29) | |
| Normal CCTA | 12 (41) |
| Coronary stenosis ≤50% | 9 (31) |
| Coronary stenosis >50% | 8 (28) |

Troponin tested, only 1 patient had Troponin I elevation.

Out of the 38 patients with calcium score imaging performed, 23 (61%) had zero calcium score. To minimize radiation exposure

2 patients did not receive calcium score imaging due to young age (<30 years). The subsequent CCTA was normal in one and severely abnormal with 3-vessel disease in the other. Among the patients with low pretest probability (N=11) none had significant coronary stenosis of >50%. Of the remaining 29 patients with intermediate probability, 8 (28%) had significant stenosis. One female patient having an intermediate pre-test probability of 11% presented with an acute coronary syndrome with ST segment depression and peak cardiac Troponin-I elevation of 11.3 ng/dL. Her coronary calcium score was zero and CCTA was normal. The subsequent cardiac MRI showed acute myocardial infarction with evidence of microvascular obstruction. Another patient having intermediate probability of 47% had a coronary calcium score of 5717 who was imputed to have significant coronary stenosis without undergoing CCTA. The ECG findings of ST/T or Q wave abnormalities did not differentiate those with or without significant coronary stenosis by CCTA.

In this case series we found that clinical risk stratification using The European Consortium pre-test probability score was effective in COVID-19 patients with CP. No patients with low pretest probability were found to have significant coronary stenosis. In contrast, 28% of patients with intermediate pretest probability had significant coronary stenosis.

While fever and respiratory distress are often the most prominent clinical presentations for hospitalized COVID-19 patients, CP

can also present as a major complaint or in combination with other symptoms, making the clinical assessment difficult based on symptoms alone. There are many possible cardiac causes for CP, including but not limited to acute coronary syndrome, myocarditis and pericarditis in COVID-19 patients. Even in the setting of ST-elevation acute myocardial infarction the absence of obstructive coronary disease is common by invasive angiography in COVID-19 patients [3]. Therefore, it is challenging to choose the appropriate diagnostic test for CP evaluation in COVID-19 patients. Nevertheless, our findings suggest that the clinical risk stratification combined with CCTA remains to be appropriate and effective for coronary artery disease evaluation in COVID-19 patients with CP.

References

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