# STEMI managed by P-PCI and COVID_19 infection an association in samawah /Iraq CCU, 1/1/2020 _ 1/11/2021 .

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## ABSTRACT

Aim: We wanted to search for incidence of direct COVID_19 infection in an association with STEMI treated by P-PCI and to see if there was an impact on result of revascularization ,success , mortalities and sequalae's .

Methods:We followed our 317 cases during the period from 1/1/2020 till 1/11/2021 regarding gender , incidence of thrombotic Vs non thrombotic lesions , age groups , arteries involved , culprit arterial segments , comorbidities , success rates and mortalities , incidence of direct COVID_19 infection association in our cases of STEMI, treated by P-PCI

Results: From our 317 cases studied male were 74.76% , females were 25,23% , thrombotic lesions were 208 (65.61%) while non thrombotic lesions were 109(34.38%) .

regarding arteries involved : LAD(54.25%) , LCX (8.5%) , RCA(32.80%) , digonal(0.31%) , OM(2.83%) , PDA(0.94%) , Ramus(0.31%) .

regarding segment involved LAD : ostial (5.99%) , proximal (17.98%) , mid(29.65%) , distal (0.94%) ,LCX (0.31%) (2.83%) (5.36%) (1.89%) .RCA : 0.63% , 10.0 % , 16.40 % , 5.36% in sequence . OM : proximal (1.57%) , mid (1.26%) , diagonal :ostial (0.31%) , Ramus : proximal (0.3%) , PDA: ostial (0.31%) .

regarding hypertotalcholestrolemia :81.7% , hyper triglyceridemia :74.66% , increased LDL :30% , decreased HDL :93.33% , increased hyperlipidemia 77% , elevated systolic BP :92% , diastolic :58 % , elevated both :54% , DM:90% , smoking :56.8% , success :99.05% , mortalities: 0.94% , and direct COVID_19 infection an association during acute infection or convalescence : 83(26.18% ).

conclusions:During the pandemic of COVID_19 , areasonable number of cases of STEMI when dealt with by P-PCI were infected directly by COVID_19 during acute infection or convalescence (26.18%) or indirectly under the influence of an impact of psychological burden causing fear of contracting the infection . COVID_19 infected cases had very good results of P-PCI and as good as those who are not infected with a high success rate (99.05%) .

Drugs used in loading and follow up of infected patients were the same in both groups .

No incidence of stent thrombosis during P-PCI of COVID_19 infected patients .all our 317 patients of STEMI death with P-PCI whether infected directly or affected indirectly by COVID_19 .

So P-PCI still the golden standard for treating both groups .

## Introduction

COVID-19 is an epidemic respiratory disease which is characterized by dyspnea , cough and nasal discharges and caused by a novel coronavirus (SARS-CoV-2). With the disease progress, COVID-19 could result in heart, kidneys, liver and multiple-organ injury.(1)

COVID-19 may lead to the activation of inflammatory cytokines and promote the release of interleukin-6 and C-reactive protein. In addition, COVID-19 plays a vital role in the formation of atherosclerotic. A systemic inflammatory response upregulates the expression of cleavage proteins, thereby destabilizing plaques. While acute myocardial infarction is usually caused by a coronary atherosclerotic plaque rupture. Through the laboratory test results of the three COVID-19 patients, we found that COVID-19 is elevated relevant blood index, which is related to the formation of atherosclerotic.(1)

In the context of chronic atherosclerotic vascular disease, infectious disease may cause acute coronary syndrome through acute inflammation, biomechanical stress, and vasoconstriction. Moreover, platelet activation and endothelial dysfunction may lead to thrombosis. Infections lead to higher metabolic demand and may cause hypoxemia, hypotension, or other vascular stresses, which can lead to thrombotic occlusion and then acute coronary syndrome . Acute respiratory infection may be associated with a higher risk of acute myocardial infarction.(1)

possible causes of acute myocardial infarction in COVID-19 patients with underlying diseases such as hypertension, diabetes, and coronary heart disease include COVID-19-related systemic inflammation, hypoxia, and coagulation disorders, which cause coronary contraction and ultimately lead to acute myocardial infarction.(1)

Methods

We followed our 317 cases during the period from 1/1/2020 till 1/11/2021 regarding gender , incidence of thrombotic Vs non thrombotic lesions , age groups , arteries involved , culprit arterial segments , comorbidities , success rates and mortalities , incidence of direct COVID_19 infection association in our cases of STEMI, treated by P-PCI .

Results

We followed 317 cases of acute MI managed by P-PCI , their association with CovId_19 infection pandemic and we got the followings :

Table 1

| Male : 237 (74 .76%) | | | | Female : 80 (25.23% ) | | | |
|---|---|---|---|---|---|---|---|
| Thrombotic lesions 208 (65.61%) | | | | Non thrombotic lesions 109 (34.38%) | | | |
| Arteries involved | LAD | LCX | RCA | Diagonal | OM | PDA | RAMUS |
| | 172 (54.25%) | 27 (8.5%) | 104 (32.80%) | 1 (0.31%) | 9 (2.83%) | 3 (0.94%) | 1 (0.31%) |
| Age groups | 20-30 ys | 31-40 ys | 41-50 ys | 51-60 ys | 61-70 ys | 71-80 ys | |
| | 7 (2.20%) | 15 (4.73%) | 78 (24.60%) | 124 (39.11%) | 83 (26.18%) | 17 (5.36%) | |

Arterial segments involved (table 2)

| | Ostial | Proximal | mid | distal |
|---|---|---|---|---|
| LAD | 19 (5.99%) | 57(17.98%) | 94 (29.65%) | 3 (0.94%) |
| LCX | 1 (0.31%) | 9 (2.83%) | 17 (5.36%) | 6 (1.89%) |
| RCA | 11 (0.63%) | 23 (10.09%) | 52 (16.40%) | 17 (5.36%) |
| OM | | 5 (1.57%) | 4(1.26%) | |
| diagonal | 1 (0.31%) | | | |
| Ramus | | 1 (0.31%) | | |

Comorbidities table (3)

| | | | | | |
|---|---|---|---|---|---|
| Lipids | ⇧ cholesterol | ⇧ Triglyceride | ⇧ LDL | ⇩ HDL | ⇧ Cholesterol &triglyceride |
| | 81.7 % | 74.66% | 30% | 93.33% | 77% |
| Hypertension | ⇧ Systolic BP | | ⇧ Diastolic BP | ⇧ Both | |
| | 92% | | 58% | 34% | |
| Diabetes mellitus | 90% | | | | |
| Family history | Positive in 38% | | | | |
| Smoking | Positive in 56.8 % | | | | |

Success and mortalities table (4)

| | |
|---|---|
| success | 314 (99.05%) |
| mortalities | 3 (0.94%) |

Covid_19 infection an association table (5)

| Cases studied | Positive covid_19 infection | Negative covid_19 infection |
|---|---|---|
| 317 | 83(26.18%) | 234 (73.18%) |

Discussion

It was said in one study (1) that COVID-19 complicated with acute myocardial infarction could increase the degree of heart failure and affect the patient's life safety .while in our study we had not seen these events . The highest incidence of our cases were reported in patients of 50 – 60 years of age groups and in those with high incidence of comorbidities like dyslipidemia , hypertension, DM , positive family history of ischemic heart disease and smoking . these things were confirmed in one study also (2) in which it is accounted thata multivariable logistic regression model adjusted to older age (>65 years), diabetes mellitus, hypertension, dyslipidemia, smoking status, prior coronary artery disease, and chronic renal failure was used to evaluate an association between the study period and combined outcome as well as its individual components. During our study we got a high success rate (99.05%) and the prognosis was good in almost all our STEMI cases treated by P-PCI while it was stated in same above study (2) that in a prospective manner a significant worsening of the prognosis of STEMI patients admitted during the Covid-19 pandemic .

Our patients had psychological burden during the pandemic which was demonstrated through patients interview and it was stated in the same study abovethat psychosocial stress was associated with an increased risk of AMI for comparison .

We saw that COVID_19 infection had a high incidence in our cases studied (26.18%) and it was stated in one study (3) that COVID-19 may increase the risk of ischemic cardiovascular events. Similar to other acute infections, the underlying mechanisms may include cytokine-mediated plaque destabilization and hypercoagulability.

During the pandemic we saw different cardiovascular events like STEMI ,Pulmonary Embolism , thrombotic CVA and myocarditis in association with positive COVID_19 infection and for comparison it was accounted in one study (4) that In the era of the coronavirus disease 2019 (COVID-19) pandemic, acute cardiac injury (ACI), as reflected by elevated cardiac troponin above the 99th percentile, has been observed in 8%-62% of patients with COVID-19 infection with highest incidence and mortality recorded in patients with severe infection. Apart from the clinically and electrocardiographically discernible causes of ACI, such as acute myocardial infarction (MI), other cardiac causes need to be considered such as myocarditis, Takotsubo syndrome, and direct injury from COVID-19, together with noncardiac conditions, such as pulmonary embolism, critical illness, and sepsis. Acute coronary syndromes (ACS) with normal or near-normal coronary arteries (ACS-NNOCA) appear to have a higher prevalence in both COVID-19 positive and negative patients in the pandemic compared to the pre-pandemic era .

In our study (73.81%) of patients with STEMI had no established COVID_19 infection during the pandemic so also it was confirmed in above study (4) that non-COVID-19 patients may also present with ACS or ACS mimics associated with the COVID-19 pandemic, either triggered by the anxiety related to corona-phobia,or to pandemic-associated financial and other emotional stress. Furthermore, many patients with ACS symptoms may avoid or delay their visit to the emergency room for fear of contracting the virus, with ensuing grave consequences.

Shock and malignant arrhythmia had been demonstrated in a large proportion of our studied patients and in this aspect it was said in the above study (4) that Shock and malignant arrhythmias have been reported as the most common outcomes of ACI. The risk of in-hospital death

among COVID-19 patients with ACI may be predicted by the peak levels of cTn during hospitalization.In addition, advanced age, coagulopathy, acute respiratory

distress syndrome (ARDS), and other comorbidities are associated with increased risk of in-hospital mortality in COVID-19 patients with ACI. Pre-existence of heart failure and hypertension, and high cardiac biomarkers correlate with worse outcomes.

Our patients of STEMI with a positive COVID_19 83 out of 317 (26.18%) and in comparison it was accounted in same study (4) that in the COVID-19 era, STEMI patients with concurrent COVID-19 infection seem to represent ~17%-27% of patients admitted with STEMI.

In our 317 patients thrombotic lesions perse or thrombosis superimposed on atherosclerotic lesions accounted of about (65.61%) while non thrombotic subtotal lesions (which was mostly due to autolysis ) constituted of about (34.38%) and in this respect it was said in the above study (4) that a higher thrombus burden involving the coronary vessels, as well as the cardiac cavities, has been reported in COVID-19 patients presenting with STEMI. so also a “cytokine storm” along with or without direct myocardial damage, together with “endotheliitis” combined with hypercoagulability, hypoxia and sympathetic activation, all leading to destabilization of pre-existing plaques and/or de novo formation of new plaques, plaque rupture and coronary thrombosis, may be responsible for ACS events in COVID-19.

A large number of our patients had attended the hospital relatively late and it was said in the above study (4) that in the era of the COVID-19 pandemic, patients hesitate or are reluctant to seek medical care wishing

to avoid hospital admission for their health problems lest they contract COVID.

In many of our STEMI cases and during P-PCI we encountered multivessel thrombosis and a high thrombus burden and in comparison it was stated that according to an observational study of 115 consecutive patients admitted with STEMI and managed with primary PCI, those presenting with concurrent COVID-19 infection had higher rates of multivessel thrombosis, stent thrombosis, higher thrombus burden, higher use of glycoprotein IIb/IIIa inhibitors and thrombus aspiration; myocardial tissue perfusion, as reflected by myocardial blush grade, and LV function were significantly lower in patients with COVID-19 with STEMI. Multiple coronary thromboses causing STEMI were reported in a patient with COVID pneumonia who was managed with thrombo-aspiration, coronary stenting and combined antiplatelet and anticoagulant therapy. (4)

For all our 317 cases of STEMI whether COVID_19 positive or negative we performed P-PCI and it was accounted that in keeping with objections to thrombolysis as first approach to STEMI in the COVID-19 era and in accordance with the established superiority of primary PCI in managing STEMI patients, a recent European Society of Cardiology (ESC) guidance document recommends primary PCI for all STEMI patients. (4).Also and in the same article it was declared that ( the American Heart Association (AHA) indicates that in the absence of significant system resource constraints, PCI should remain the primary and preferred reperfusion strategy for patients with STEMI based on superior outcomes with PCI including preservation of LV function and lower rates of reinfarction, stroke, and death.Furthermore, the AHA states that testing

for COVID-19 should not delay primary PCI for those with clear STEMI. Fibrinolysis should be considered for patients with STEMI who cannot receive PCI and coronary reperfusion within 120 minutes.

Stress was so important in our patients whether COVID_19 positive or negative and it was reported in one study (5) that Covid-19 pandemic-related lockdown and the accompanying stressors can potentially trigger AMI in vulnerable non-infected individuals. The great majority of our patients had more than one cardiovascular risk factor . So also. It is no surprise that lockdown stress, loneliness, isolation, financial hardships and anger were the most commonly reported triggering events to precede the onset of AMI, and that most of the patients reported exposure to at least two triggering events.

In our patients once we diagnosed STEMI we went urgently for P-PCI while in one study (6) it was stated that the dilemma is for the patient who is awaiting COVID-19 test results that may delay the treatment from a potentially reversible cause of life-threatening disease.

We encountered many cases of thrombotic events like sagittal vein thrombosis , Pulmonary Embolism , Deep vein thrombosis and mesenteric thrombosis in addition to thrombotic STEMI in our COVID_19 infected patients , and for comparison it was confirmed in one study (7) that thrombotic complications of COVID-19 infection have become increasingly apparent as the disease has infected a growing number of individuals. Although less common than upper respiratory symptoms, thrombotic complications are not infrequent and may result in severe and long-term sequelae. Common thrombotic complications include pulmonary embolism, cerebral infarction, or venous thromboembolism; less commonly seen are acute myocardial injury, renal artery thrombosis, and mesenteric ischemia. Several case reports and case

series have described acute myocardial injury in patients with COVID-19 characterized by elevations in serum biomarkers.

We thought that COVID_19 directly and indirectly affects cardiovascular system and this was established in one study (8) where it was said that COVID-19 directly and indirectly affects the cardiovascular system. Potential mechanisms of cardiovascular injury include direct myocardial injury from hemodynamic derangement or hypoxemia, inflammatory myocarditis, stress cardiomyopathy, microvascular dysfunction or thrombosis due to hypercoagulability, or systemic inflammation (cytokine storm), which may destabilize coronary artery plaques , so also in the same study it was stated that clinical impact of SARS-CoV-2 infection is greater in those with prior cardiovascular disease (CVD) and increasing age. In one study, patients with prior CVD made up 22.7 percent of all fatal cases, and the case fatality rate was 10.5 percent.

In our series COVID_19 had no influence on success or failure of P-PCI and that was confirmed in one study (9) which stated that there is little information on the direct impact of COVID-19 on clinical management and outcomes of AMI.

We faced both arterial an venous thrombosis complication associated with COVID_19 and in the same aspect it was said that (10) SARS-CoV-2 was associated with an increased risk of both arterial and venous thrombotic complications. This association is strongest for venous thromboembolic disease, but the risk of myocardial infarction (MI) is approximately doubled in the 7 days after COVID-19 diagnosis.

## Conclusion

During the pandemic of COVID_19 , a reasonable number of cases of STEMI when dealt with by P-PCI were infected directly by COVID_19 during acute infection or convalescence (26.18%) or indirectly under the influence of an impact of psychological burden causing fear of contracting the infection . COVID_19 infected cases had very good results of P-PCI and as good as those who are not infected with a high success rate (99.05%) .

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