

## CASE REPORT

# HIGH RISK PRIMARY PERCUTANEOUS CORONARY INTERVENTION (PCI) IN PATIENT WITH ACUTE STEMI ANTERIOR, CHRONIC KIDNEY DISEASE, AND CONFIRMED COVID-19

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### ABSTRACT

**Background :** An acute ST-elevation myocardial infarction anterior occurs due to occlusion of left anterior descending artery (LAD) branch of left coronary artery. The occlusion causing transmural myocardial ischemia which in turn to myocardial infarction due to myocardial injury or necrosis. Not only Primary Percutaneous Coronary Intervention should be performed in case of STEMI less than 120 minutes as the risk of the adverse events would increase if exceeding the total ischemic time, but also the procedure can be high risk in patients with multiple clinical factors or comorbidities which can increase the risk of complications.

**Case Report :** We report a case of a 57 years old man who presented Acute STEMI Anterior, Coronary Artery Disease (CAD) 3 Vessel Diseases (VD), Hypertension Heart Disease (HHD), Chronic Kidney Disease (CKD) on Hemodialysis (HD), with COVID-19 confirmed.

**Results:** The left coronary artery was successfully stented by PCI and Coronary Angiogram (CAG) procedures with TIMI 3 flow, minimal bleeding and others complications.

**Keywords:** ST-elevation myocardial infarction, Percutaneous Coronary Intervention, Chronic Kidney Disease on Hemodialysis, COVID-19

### INTRODUCTION

Cardiovascular Disease (CVD) is one of the most well-known cause of deceased globally compared to other diseases based on World Health Organisation (WHO) report. The prevalence of Acute Coronary Syndrome (ACS) in the Asia Pacific region about 5%. The most common cause of artery occlusion is atherosclerosis. Atherosclerosis is the progression of disease in which fatty deposition infiltrated and function of endothelial vessel altered creating calcification in intimal layers which may later causing obstruction of vessel for supplying the need of tissues.<sup>1,2,3,4</sup>

The process of atherosclerosis starts when the bulk of cholesterol LDL develop in endothelial layers which promote the aggregation of immune cells through inflammation and the buildup of foam cells are developed. Later, the subsequent of the process causing the cells such smooth muscle cells to undergo damage in which the process of apoptosis as well as necrosis take place. Not only endure the process of apoptosis and necrosis, but also the complex process of matrix synthesis, the process of remodeling and calcification, the rupture of fibrous cap and the formation of thrombosis occur.<sup>5,6</sup>

The most common location for plaques is the proximal LAD. Predilection sites of atherosclerosis are characterized by the changes of endothelial turnover and gene expression, presence of subendothelial dendritic cells, and intimal thickening. Sites with low endothelial shear stress, located near branch points are most susceptible. The occlusion causing transmural myocardial ischemia which in turn to myocardial infarction due to myocardial injury or necrosis. Cell becomes ischemic if there is an increase of oxygen demand or decrease of oxygen supply. Anaerobic metabolism will occur as compensatory mechanism in ischemic cells. In a second, there is dysfunction of relaxation and contraction of myocardium. If the occlusion cannot be removed and reperfusion does not occur within 40-60 seconds, the damage becomes irreversible.<sup>4,6</sup>

Primary PCI should be performed in STEMI less than 120 minutes because the risk may be increase cause of the adverse events during the waiting period according to ESC/AHA guideline. PCI is an invasive procedure to sustain the occluded vessels aiming to reduce consequent of occlusion and the complication of procedure is nearly rare. Nevertheless, every procedure will have complications such in patient with multiple clinical factors or comorbidities; renal failure, diabetes mellitus, and COVID-19.<sup>7,8</sup>

## CASE REPORT

A 57 years old man (Mr.P) arrived at the emergency unit of hospital, who had chief complain of substernal chest pain with radiating to the left arm in the last 5 hours before admission to the hospital. The patient's medical history has hypertension, diabetes mellitus type 2, and dyslipidemia for 3 years. The patient is taking ramipril, glimepiride, metformin, and simvastatin, but not regularly. Patient also complaining shortness of breath, cough, and fever 3 days ago. The physical examination of patient showed the vital signs such a blood pressure of 90/60 mmHg, pulse rate 100 bpm, respiration rate 28 bpm, temperature 38,40°C, and prolonged capillary refill time. According to laboratory findings, patient diagnosed CKD and undergo HD therapy after PCI procedure.

### INVESTIGATION

Mr. P (57 years old) was diagnosed with CAD 3 VD, HHD, CKD on HD, Acute STEMI Anterior, COVID-19

confirmed. Based on the results of angiography, LM was normal, a total occlusion of the LAD was found, 70-80% stenosis of LCX, and 80-95% stenosis and calcified vessel of RCA.

The laboratory test for the patient were low hemoglobin level of 8.2 g/dl, low hematocrit level of 22.9%, high leukocyte counts about 15.21 x 10<sup>3</sup> μL (0/0/2/90/50/3), and normal platelet counts 156 x 10<sup>3</sup> μL, blood sugar level 176 mg/dl, high creatinine level of 11.84 mg/dl and low eGFR about 4.7 ml/min/1.73 m<sup>2</sup>, prolonged prothrombin time about 19.7 s, APTT 31.3 s, high troponin T level > 2000 ng/L, and RT PCR COVID-19 positive.

X-ray shows cardiomegaly and right hilum enlargement. The ECG showed ventricular rate 101 bpm, PR interval 160 ms, QRS duration 86 ms, QT/QTc interval 340/412 ms, P/QRS/T axes 49/95/162 deg, sinus tachycardia with frequent PVCs, rightward axis, possible anterior infarct, inferior/lateral ST-T abnormality may be due to myocardial ischemia.

**Table 1. Laboratory findings of the patient**

Variable	Result	Reference range	Units
Hemoglobin	8.2	14.0 – 16.0	g/dl
Hematocrit	22.9	40 – 52	%
Platelets	156	150 - 440	10 <sup>3</sup> /μL
Leukocyte	15.21	3.8 – 10.6	10 <sup>3</sup> /μL
Basophil	0	0 – 1	%
Eosinophil	0	1 – 3	%
Rod Neutrophil	2	2 – 4	%
Segment Neutrophil	90	40 – 70	%
Lymphocyte	50	20 – 40	%
Monocyte	3	2 – 8	%
Blood Sugar	176		mg/dL
Creatinine	11.84	0.5 – 1.3	mg/dL
eGFR	4.73	>60	ml/min/1.73m <sup>2</sup>
PT	19.70	10.8 – 14.4	s
APTT	31.30	27 – 38	s
Troponin T	>2000	<50 ng/L	ng/dL

**Table 2. SARS Cov2 RT PCR**

Variable	Result	Comments
SARS Cov2 RT PCR IV - PH	Positive	E gene 12.61 RdRP 13.12

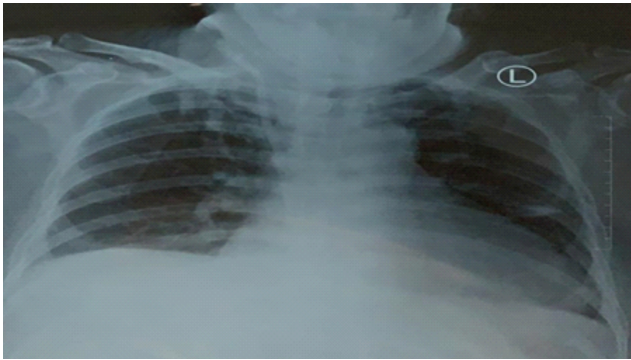


Figure 1. X-Ray showing cardiomegaly sign

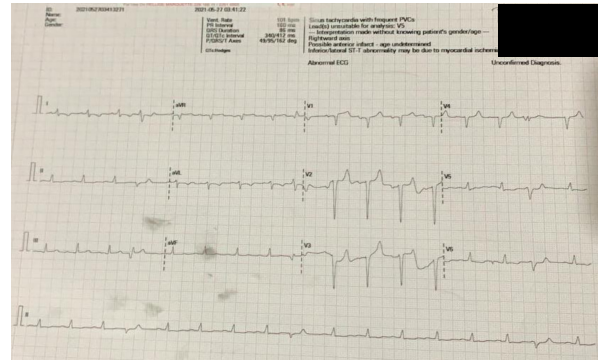


Figure 3. The ECG showing PVCs and Acute Anterior STEMI patterns



Figure 2. Coronary Angiogram showing the LAD before and after reperfusion

## TREATMENT

Patient performed cannulating PCI to LCA with guiding catheter EBU 3.5/6 Fr, wiring with guidewire Intuition successfully passed to the distal lesion, ballooning using a coronary balloon catheter Rise NC 2.5 x 1.5 mm at 14 atm 10 seconds, the flowing was well to distally, then stenting was performed with DES Biomatrix Alpha 3.0 x 36 mm at 10 mm atm 20 seconds in the proximal-mid LAD, then post dilation with a balloon stent at 14 atm 10 seconds.

## OUTCOME AND FOLLOW-UP

Good results with TIMI III flow, no dissection or perforation, minimal bleeding. Therapy plan include DAPT, high dose statin, anticoagulant, natrium bicarbonate, calcium carbonate and folic acid. Patient should be followed up by monitoring vital signs, ECG, and laboratory test (hematology, glucose, renal function, troponin T, and D-dimer).

## DISCUSSION

The purpose of PCI to resolve the occluded coronary artery to recover blood supply in infarcted areas should be performed within 120 minutes to achieve beneficial effect according to AHA guideline. Primary PCI is preferred to fibrinolytic therapy when time to treatment delays is short, the patient presents to a high volume, and well-equipped center experienced interventional cardiologists and skilled support staff. As seen in our case, our patient was diagnosed

acute anterior STEMI, Diabetes Mellitus (DM) type 2, CKD, and COVID-19 confirmed. It is challenging to undergo PCI procedure with these conditions.

The exposure of using contrast in PCI has unneglected effects to renal system such Contrast-induced Nephropathy (CIN) and long-term renal impairment. Chronic inflammation on CKD causes impairment of glomerular filtration due to endothelial dysfunction. CKD resulting in the loss of normal excretory function and a reduction in the removal of any substances, such as contrast molecules.

CIN which is one the severe complication cause by angiography was defined when the serum creatinine (Scr) elevated more than 24% or  $> 0.5$  mg/dL from baseline within 48 hours if the cause nephropathy has been eliminated. The process of CIN started when less oxygenated of medullary part of renal caused by decrease of vasodilator or increase of vasoconstriction undergo toxicity effect to cells and cell apoptosis. CIN will leads to acute kidney injury or acute on CKD if the patient has been had CKD and transient/persistent renal dysfunction.

Despite the incidence of CIN after PCI between 0 and 24%, the complications of CIN and renal dysfunction are transient and reversible. Based on the case, patient condition shows the tendency of developing CIN such as preexisting renal insufficiency (eGFR  $< 60$  mL/min), diabetes mellitus type 2, hypertensive heart disease, and use of contrast in PCI procedure. Such condition of impairment in systemic perfusion, administration of contrast medium, and the usage

of prophylactic hydration in renal treatment are unfavorable risk for patient with AMI who has tendency to develop CIN. Nonetheless, those conditions can be alternatively managed by reducing volume expansion and selective approach to left ventriculography that may limit the use of contrast in renal dysfunction.

PCI also challenging to be undergone in patients with DM. The procedure of PCI in patient with diabetes mellitus can be unsuccessful because the conditions such diabetic arteriopathy, myocardial dysfunction, chronic kidney disease, the usage of antiplatelet and the usage of exogenous insulin. Moreover, restenosis and the formation of plaques outside stented segments also are other aspects that alter the PCI procedure. The incidence of restenosis following coronary intervention had been 30 to 40% and diabetic arteriopathy also associated with outcome after PCI. However, DM said to be more correlated independent factor of mortality after PCI compared to those factors.

There was a report from AHA that state repeat revascularization after PCI is higher than after CABG (12.6% versus 4.8%;  $P < 0.001$ ). From this report, it suggested that bypassing conduit of longer segments of the coronary artery in DM patients was better option than using stent in treating spot for better prognosis in the future. Even though, there are several drawbacks of bypassing conduits in small diabetic vessels.

This case report showed that the patient suffered from advanced renal failure and underwent PCI. According to latter findings, CABG was a better option compared to PCI because CABG showed long-term survival benefit. Nonetheless, patient that underwent CABG has a tendency to develop acute kidney injury 2 -3 times higher than PCI. Even though PCI was considered to be hemodynamically supportive for patient with diabetes and STEMI, CABG is still a favorable choice as diabetic patient tend to have extensive multivessel CAD where one of the prominent parts is proximal segment of left anterior descending coronary artery. Despite the CABG is better option than PCI in diabetic patient, PCI can be still performed by ensuring the comprehensive care such oversee cardiac rehabilitation, maintain blood pressure as well as lipid level, and controlling the intake of ACE inhibitors.

According to the latest studies, patients with ACS and diagnose with COVID-19 statistically said to have high mortality rates. This was because AMI patients with COVID-19 showed low platelet counts, increase in D-dimer level and prolong prothrombin time. These findings strengthened the evidences that these patients can readily bleeding and cause heart failure and shock. Therefore, the need of PCI as well as DAPT procedure are compulsory.

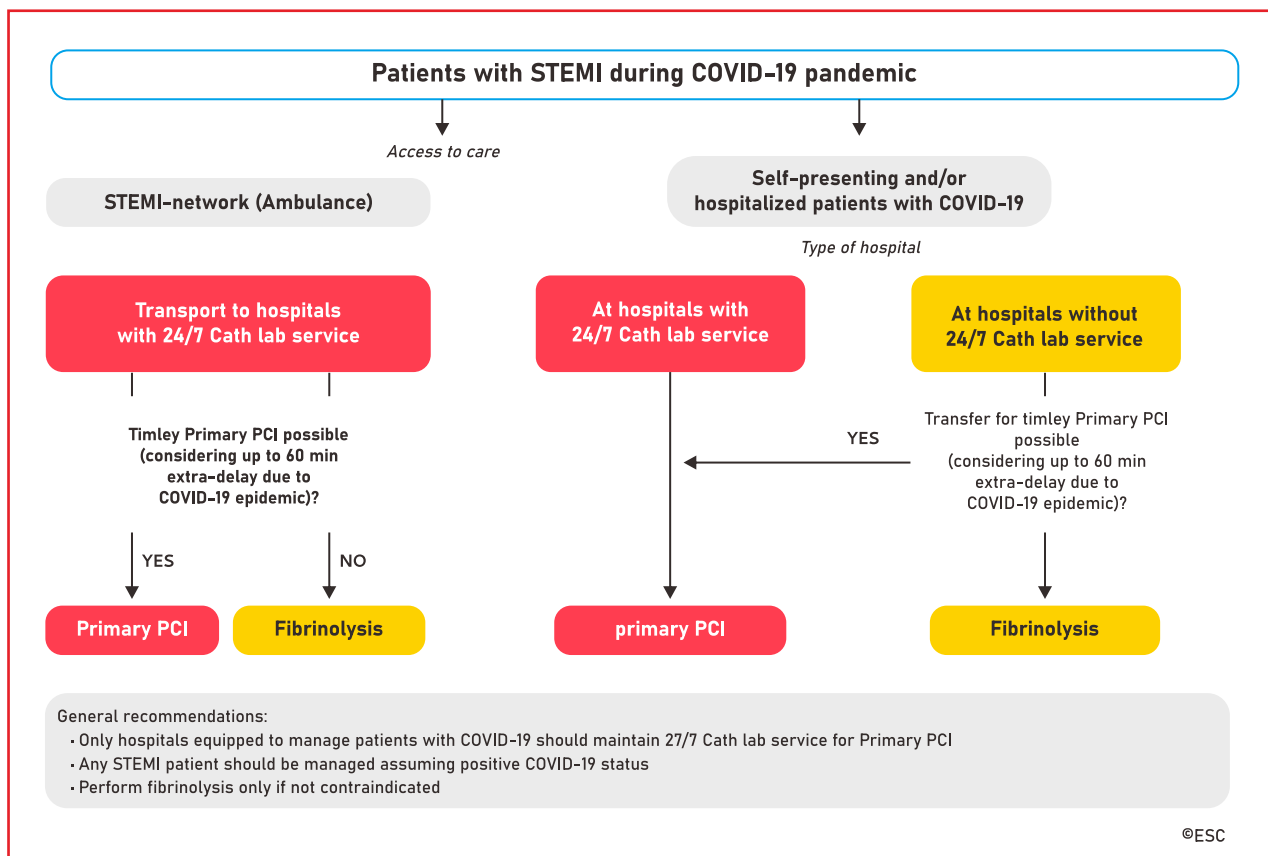


Figure 4. Management of Patients with STEMI during COVID-19 pandemic<sup>14</sup>

According to EHJ 2020, the main principles of STEMI management in the COVID-19 pandemic is the maximum delay from STEMI diagnosis to reperfusion of 120 minutes should remain the goal for reperfusion therapy while all STEMI patients should be considered potentially infected. AHA reported the temporary emergency guidance to STEMI systems of care during COVID-19 pandemic, such as consideration should be given to use of a negative pressure room, limiting staff in the room, and terminal cleaning with possibly a longer 4 to 6 hours to clean.

Patient undergoing PCI procedure because it is recommended in patients with resuscitated cardiac arrest and an ECG consistent with STEMI irrespective of the CKD stage, and still can be performed in diabetic patient. The successful outcomes of PCI procedure may be defined by angiographic, procedural, and clinical criteria. This case showed TIMI III flow which means the achievement of a minimum stenosis diameter reduction about < 50%. The absence or minimum complications after PCI procedure can be monitored by CK-MB level 3 to 5 times and non-Q-wave MIs. Clinically successful PCI marked by anatomical and procedural success with relief of signs and symptoms of myocardial ischemia after recovery from the procedure. In this case, we can say that the PCI procedure was successful which is marked by TIMI III flow, no complications with minimal bleeding, and relief of signs and symptoms of myocardial infarction.

Patient is planned to taking DAPT and getting hemodialysis after PCI procedure. DAPT is the combination between aspirin and P2Y12. DAPT is recommended and safe to be given according to patient factors comorbidity. Ticagrelor should be considered in CKD patients who are not considered to be at high risk of bleeding due to the lower risk of bleeding than clopidogrel. Hemodialysis should be performed according to National Kidney Foundation 2015 due to GFR < 30 mL/min/1.73 m<sup>2</sup>.

## CONCLUSION

Percutaneous coronary intervention is really challenging as seen in our case but it has been successfully performed. The risk becomes much higher when patient presents acute anterior STEMI with CKD, DM type 2, and COVID-19 that can lead to any complications after PCI procedure, such as CIN, acute on CKD, high risk of bleeding, cardiogenic shock, heart failure, restenosis and the development of vulnerable plaques outside stented segments which further increase mortality rates. Nonetheless, the need of PCI for a patient with STEMI is compulsory for PCI-accessible hospital and the challenges of conserving patient conditions with COVID-19 need further evidences based on research to predict as well as treat the outcome from sophisticated condition.

## CONFLICT OF INTEREST

None declared.

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## FUNDING SOURCES

None.

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