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Case Report

Management of anterior ST-elevation myocardial infarction presenting more than 48 hours from symptom onset without reperfusion therapy in the cardiac care unit

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ABSTRACT

ST-elevation myocardial infarction is a form of acute coronary syndrome that is the leading cause of death worldwide. Treatment with reperfusion therapy in the form of primary percutaneous intervention is the main treatment to reduce morbidity and mortality. However, reperfusion therapy is not recommended for patients presenting with symptoms onset of more than 48 hours. A 62-year-old male patient was diagnosed with anterior STEMI with symptoms onset of more than 48 hours based on complaints of anginal chest pain and shortness of breath. ST-segment elevation in V1-V4 and pathological Q in V1-V3 on ECG and increased hs-Troponin I was reported. The patient was not treated with reperfusion therapy based on treatment recommendations. The patient was given vasodilators, beta-blockers, statins, heparinization, and comorbid infection control in the cardiac care ward. Clinical improvement was obtained, and the patient was discharged after seven days of hospitalization and then was planned for Dobutamine Stress Echo during the follow-up visit. Conservative management and viability testing are the main options for patient management in STEMI with symptom onset of more than 48 hours without any complaints of chest pain, stable hemodynamics, and no life-threatening arrhythmia.

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INTRODUCTION

Acute coronary syndrome (ACS) is a significant cause of death worldwide (García-García et al., 2017). Based on data collected in Riset Kesehatan Dasar (Riskesdas) in 2018, the prevalence of ACS in Indonesia was 1.5% or an estimated 2,650,340 people (Kemenkes RI, 2018).

ST-segment elevation myocardial infarction (STEMI) is a form of ACS that requires immediate treatment because reperfusion time greatly determines the patient's clinical outcome (Lambert et al., 2016). Percutaneous coronary intervention is the reperfusion therapy of choice for STEMI when performed appropriately (García-Blas et al., 2021). Patients presenting with chest pain with an onset of <12 hours are indicated for reperfusion therapy with the recommendation of IA, where the leading choice of therapy was primary PCI instead of fibrinolysis. If PCI cannot be performed due to limited facilities and infrastructure in the hospital, fibrinolysis is recommended as long as there are no contraindications (Ibanez et al., 2018). In STEMI, with the onset of chest pain more than 12 hours, primary PCI is indicated in patients with complaints of chest pain, unstable hemodynamic status, and arrhythmias. Routine PCI is not recommended in patients who do not complain of chest pain with stable hemodynamic conditions (Ioannidis & Katritsis, 2007).

In this case report, we will discuss a patient with anterior STEMI with the onset of symptoms of more than 48 hours who was not treated with reperfusion therapy. Heparinization, optimization of vasodilator and beta-blocker therapy, and managing comorbid factors are the main things in patient management in the cardiac care ward. Post-infarction cardiac viability test to assess the benefit of reperfusion therapy in the patient must be planned after discharge.

CASE REPORT

A 62-year-old man was referred from a Regional Private Hospital in Wonosari to the Rumah Sakit Umum Pusat (RSUP) Dr. Sardjito Yogyakarta with a diagnosis of anterior STEMI with symptoms onset of more than 48 hours and hypertension. Two days before hospital admission, the patient complained of chest tightness radiating to the left arm. The patient denied complaints of cold sweat, nausea, vomiting, or shortness of breath. The chest pain was said to be felt for an hour, and the patient did not seek treatment. The next day, the patient complained of chest pain, shortness of breath, and cough. The patient was brought to the emergency room (ER) at the hospital, and electrocardiography (ECG) was performed, which showed sinus rhythm, rate of 120 times per minute, normal axis, ST-segment elevation in leads V1-V4, pathological Q in leads V1-V3, and ventricular extrasystole (VES) (Figure 1).

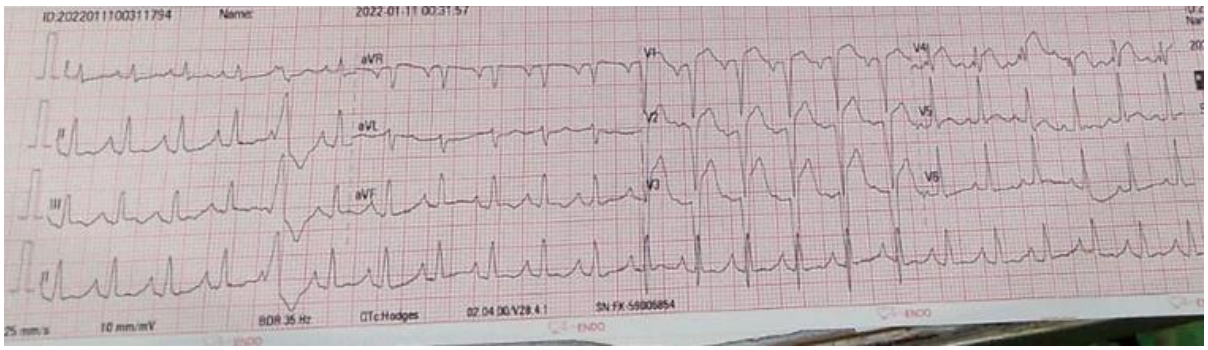

Figure 1. Initial ECG from the referring hospital (11 January 2022)

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Initial physical examination of the patient during admission to the ER of RSUP Dr. Sardjito Yogyakarta found that the patient looked moderately ill with compos mentis consciousness, a weight of 50 kg, a height of 165 cm, and a body mass index of 18.36 kg/m^2. Vital signs data of the patient showed a blood pressure of 107/75 mmHg in a lying position with the cuff on the right arm, heart rate of 95 times/minute with a regular rhythm, respiratory rate of 28 times/minute, peripheral oxygen saturation of 95% in the right arm with oxygen supplementation of 10 liters per minutes via a non-rebreathing mask, and body temperature of 37°C in the axilla. Examination of the head revealed that the eye's conjunctiva was not pale, and the sclera was not icteric. Examination of the neck revealed a jugular venous pressure of 5+2 cmH_2O, and no enlarged lymph nodes were found. On lung examination, the right and left hemithorax were symmetrical. No asymmetrical chest expansion or retractions were examined, and increased vesicular sounds and coarse crackles were found in both lung fields. A cardiac examination revealed no cardiomegaly with ictus cordis in the left mid-clavicular line in the sixth intercostal space and no heart murmurs. On abdominal examination, the abdominal wall was flat, bowel sounds were normal, no tenderness, and no dullness or enlargement of the abdominal organs was found. Examination of the extremities did not reveal any abnormalities. The extremities felt warm, and no leg edema or finger cyanosis was found.

The patient was reevaluated with a 12 lead ECG at RSUD Dr. Sardjito, which showed a sinus rhythm, rate of 120 times per minute, normal axis, ST-segment elevation in leads V1-V4 and pathological Q in leads V1-V3 (Figure 2). The anteroposterior chest X-ray showed pulmonary edema, suspected bacterial bilateral pneumonia, and cardiomegaly with left ventricular hypertrophy (LVH) (Figure 3).

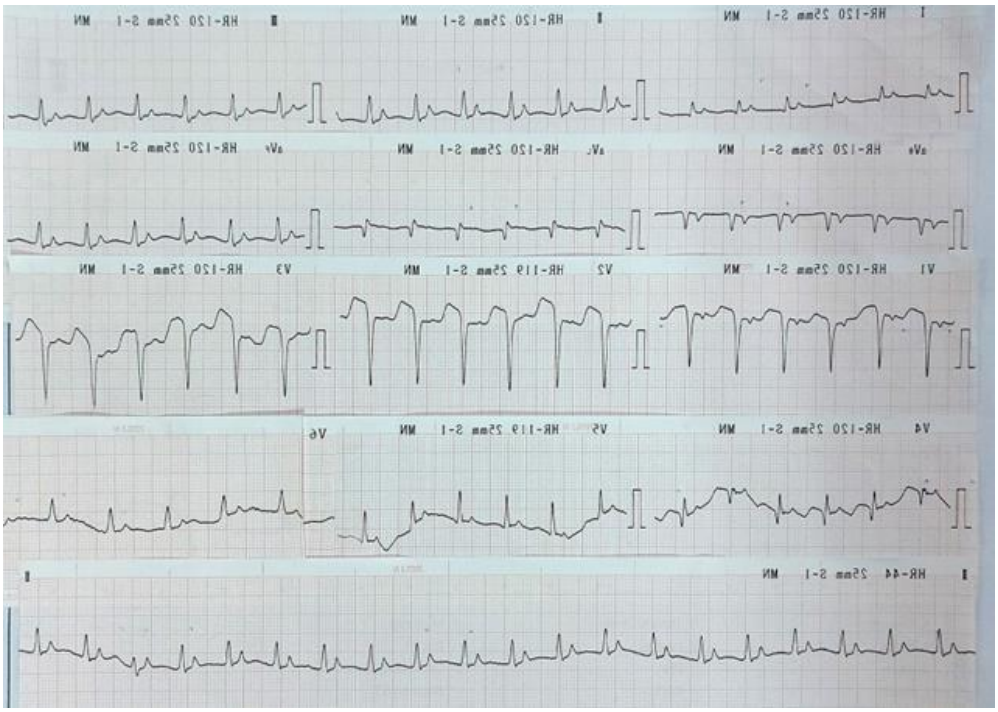

Figure 2. ECG on admission in RSUP Dr. Sardjito Yogyakarta, 11 January 2022

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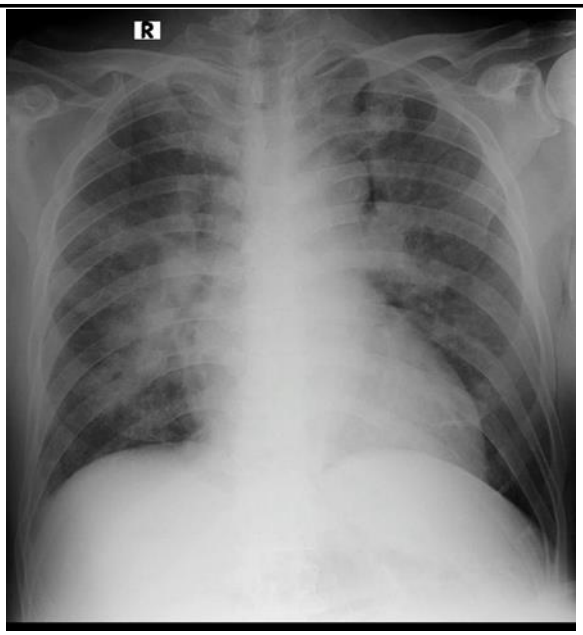

Figure 3. Chest x-ray during hospital admission on 11 January 2022 (showed alveolar pulmonary edema, suspected bacterial bilateral pneumonia, cardiomegaly with LVH)

Laboratory examinations found Hb levels of 14.9 g/dL, leukocytes of 20.8x10^3/µL, platelets of 231x10^3/µL, and hematocrit of 45.5%. On the differential count of the leukocytes, the segment was 91.7%, the lymphocytes were 4%, the monocytes were 4.2%, the eosinophils were 0.0%, and the basophils were 0.1%. Blood chemistry examination showed blood urea nitrogen (BUN) of 33.8 mg/dL, creatinine of 2.95 mg/dL, albumin of 3.28 g/dL, serum glutamate oxaloacetate transaminase (SGOT) of 280 U/L, serum glutamate pyruvate transaminase (SGPT) of 120 U/L, sodium of 144 mmol/L, potassium of 4.68 mmol/L, chloride of 109 mmol/L, and blood sugar of 130 mg/dL. The coagulation status showed a plasma prothrombin time (PPT) of 14.3 seconds with a control of 11 seconds, the International Normalized Ratio (INR) of 1.31, and an APTT of 38.6 seconds with a control of 31.2. Examination of cardiac enzymes found an increase in the value of hs-Troponin I of 38230 ng/L. Blood gas analysis (BGA) upon admission to the hospital showed a pH of 7.33, PO_2 of 75.8 mmHg, SO2 of 96.5%, PCO2 of 38.2mmHg, HCO3 of -19,9 mmol/L and A-aDO2 of 511 mmHg with the impression of uncompensated metabolic acidosis with type I respiratory failure and acute respiratory distress syndrome (ARDS). Inflammation parameter examination in the patient showed the value of D-dimer of 5345 ng/ml, C-reactive protein (CRP) of >150mg/L, procalcitonin of 79.75 ng/ml, interleukin (IL)-6 of 109 pg/ml and Ferritin of 2000.

The patient was diagnosed with anterior STEMI with symptoms onset of >48 hours, community-acquired pneumonia with differential diagnosis of viral pneumonia (COVID-19), ARDS with respiratory failure type I, elevated transaminase enzymes related to ischemic with differential diagnosis of infection, acute kidney injury with differential diagnosis of acute on chronic kidney disease (CKD) and hypertension. The patient was treated in an isolation room due to suspected COVID-19 from clinical and radiological assessments. However, PCR results were negative in two examinations, and the patient was transferred to the cardiac care unit. During treatment, the patient received an injection of 1 gram of cefoperazone per 12

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hours, 400 mg of oral moxifloxacin per day, 250 mg of oral ursodeoxycholic acid three times per day, 40 mg of oral furosemide per day, 25 mg of oral captopril three times per day, 80 mg of oral aspirin per day, and 40 mg of oral atorvastatin per day.

During treatment, the patient did not complain of any chest pain or decreased shortness of breath. On the sixth day of treatment, the patient underwent a chest X-ray examination, and the results showed an improvement in the pneumonia. The patient was given heparinization therapy for three days of treatment. During the treatment in the CCU, vital signs were stable. The patient underwent an echocardiography examination, which showed atrial dilatation (LAVI 38 ml/m2), left ventricular dilatation with eccentric LVH (LVIDd 66 mm, LVIDs 55 mm, IVSd 7 mm, IVSs 8 mm, LVPWd 12 mm, LVPWS 8 mm, decreased global and segmental left ventricular systolic function with an ejection fraction of 20%, and global hypokinetic and akinetic in the broad apical segment accompanied by grade II left ventricular diastolic dysfunction. The right ventricular systolic function was normal (TAPSE 18 mm), and there were no abnormalities in the heart valves.

Sputum culture results showed *Klebsiella pneumoniae,* which was sensitive to ceftazidime, ampicillin, cefepime, ciprofloxacin, and meropenem, whereas blood cultures did not grow any bacteria. The follow-up blood evaluation showed Hb of 14.7, leucocytes of 13.3 x103/µL, platelets of 263 x 103/µL, and hematocrit of 46.1%. The differential count of the leukocytes showed 79.6% of segments, 12.1% of lymphocytes, 7.1% of monocytes, 1.1% of eosinophils, and 0.1% of basophils. Blood chemistry examination showed SGOT of 72 U/L, SGPT of 96 U/L, BUN of 30.1 mg/dl, creatinine of 1.68 mg/dl, and ferritin of 1374 ng/mL. Evaluation of blood gas analysis obtained a pH value of 7.42, PO_2 of 138mmHg, PCO_2 of 38.1 mmHg, HCO_3 of -25 mmol/L, and SO_2 of 99%. The chest X-ray evaluation showed perihilar bronchitis with improved lung abnormalities (Figure 4).

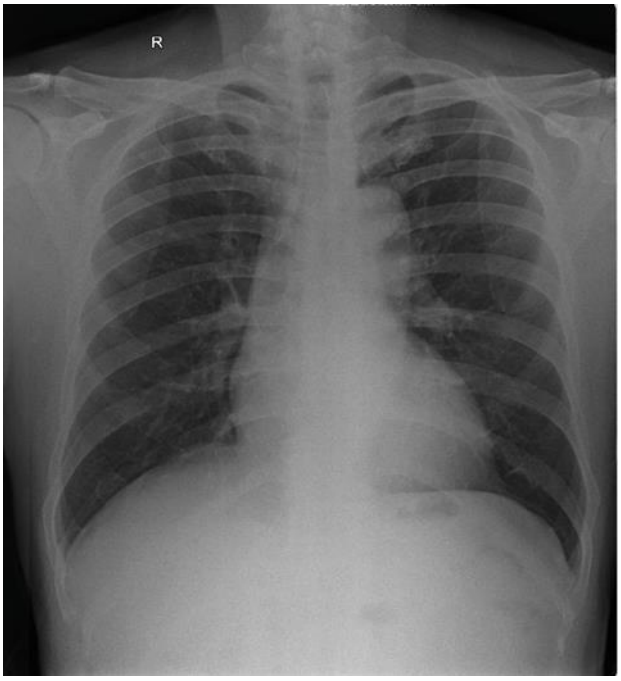

Figure 4. Chest x-ray during re-evaluation on 17 January 2022 (showed peripheral bronchitis, normal heart size, improvement of abnormality based on previous x-ray)

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The patient was discharged on the seventh day of treatment. He was given 80 mg of aspirin per day, 75 mg of clopidogrel per day, 40 mg of atorvastatin per day, 8 mg of candesartan per day, 2.5 mg of bisoprolol per day, 30 mg of lansoprazole per day, 40 mg of furosemide per day, 500 mg of ciprofloxacin two times 500 mg per day and 200 mg of acetylcysteine three times per day as outpatient medication. Before discharge, the patient was tested for a 6-minute walking test (6MWT) at a distance of 374 meters with a value of 4.17 METS. Based on the 6MWT results, the patient was given daily activity education and physical exercise at home. In the first week, the patient was advised to walk 900 meters/30 minutes or 450 meters/15 minutes with a break of 5-10 minutes. In the second week, the patient was advised to walk 1000 meters/30 minutes or 500 meters/15 minutes with a break of 5-10 minutes. In the third week, the patient was advised to walk 1100 meters/30 minutes or 550 meters/15 minutes with a rest of 5-10 minutes. In the fourth week, the patient was advised to walk 1200 meters/30 minutes or 600 meters/15 minutes with a rest of 5-10 minutes. The patient was planned for cardiac viability testing during the follow-up visit.

DISCUSSION

Cardiovascular disease (CVD) is one of the global health problems in the world. Over the past few decades, the overall incidence of CVD, especially ACS, has increased rapidly (Kastrati, Coughlan, & Ndrepepa, 2021). It is the leading cause of death from cardiovascular disease, especially in elderly patients (Dou et al., 2019). ST-segment elevation myocardial infarction is diagnosed definitively by typical angina complaints of pressure/ heaviness in the retrosternal area radiating to the left arm, neck, jaw, interscapular area, shoulder, or epigastrium. These complaints can last intermittently or persistently (> 20 minutes). Typical angina complaints are often accompanied by diaphoresis, nausea/vomiting, abdominal pain, shortness of breath, and syncope. The elevation of ST-segment, ST depression, or T inversion diagnosed as for myocardial ischemia, or new LBBB on ECG accompanied by an increase in cardiac markers, namely CKMB enzymes or Troponin I/T, is diagnostic for STEMI (Ibanez et al., 2018). This patient had previous complaints of anginal chest pain and shortness of breath, which could be caused by mechanical complications of heart failure, which could cause pulmonary edema due to heart pump abnormalities. In this patient, ECG showed ST-segment elevation in V1-V3, and a pathological Q. Cardiac enzymes test reported increased Troponin I.

Primary percutaneous coronary intervention is the preferred reperfusion therapy over fibrinolysis if performed by an experienced team within 120 minutes of first medical contact. It is indicated for patients with severe acute heart failure or cardiogenic shock unless it is anticipated that a long delay in PCI will occur and if the patient presents with a late onset of symptoms (Ibanez et al., 2018). During treatment in the CCU, this patient did not complain of chest pain and shortness of breath, and the patient's daily ECG showed no arrhythmias; therefore, revascularization therapy was not taken. Based on the European Society of Cardiology (ESC) guidelines, for STEMI patients with symptoms onset of more than 48 hours, PCI can be performed if there are ongoing complaints of chest pain, unstable hemodynamics, complaints of heart failure, and life-threatening arrhythmias (Kastrati et al., 2021). In STEMI patients with symptoms onset of 3-28 days, there was no reduction in mortality or the incidence of reinfarction and heart failure in a patient undergoing PCI compared to patients who only underwent optimization of therapy

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without revascularization (McNair, Bilchick, & Keeley, 2019). The patient in this case report was given unfractionated heparin (UFH) for three days with APTT evaluation/control with a target of 1.5-2.5. According to guidelines issued by the ESC, routine administration of UFH is performed in patients with STEMI as an anticoagulant (Ibanez et al., 2018).

During the COVID-19 pandemic, the number of patients diagnosed with STEMI decreased due to overlapping symptoms of shortness of breath caused by lung disorders caused by COVID-19 and heart disease (Clifford et al., 2021). The COVID-19 pandemic has greatly affected health services worldwide, including primary PCI services, which decreased by 19%. However, no significant relationship exists between the COVID period and the Major Adverse Cardiac Event (MACE). Effective primary PCI can improve the prognosis of STEMI patients during the COVID-19 pandemic (Gong et al., 2022). The patient in this case report was suspected to be having COVID-19 because the chest x-ray showed pneumonia in both lung fields. Even though the antigen swab examination came out negative, the patient was still suspected of having COVID-19 to stratify the placement of patients with COVID-19 until proven otherwise. The patient underwent a PCR swab examination, which was negative on two consecutive tests. The patient was then transferred to a non-infectious treatment ward.

Dual antiplatelet therapy (DAPT) is recommended up to 1 year after the onset of myocardial infarction (Costa et al., 2015). The patient in this case report receiving aspirin 80 mg/day and clopidogrel 75 mg/day, which was planned to be given for one year. The administration of dual antiplatelets increases the incidence of gastric ulcers on long-term administration. Administration of a proton pump inhibitor (PPI) in patients with ACS who receive DAPT is strongly recommended to reduce the incidence of upper gastrointestinal bleeding. Research conducted by Ralapanawa et al. (2019) and Lai et al. (2002) found that lansoprazole administration reduced the incidence of gastric ulcer complications in patients receiving aspirin (Population, 2009; Ralapanawa et al., 2019) . The patient in this case report was given lansoprazole during treatment in the ward and continued to be given as outpatient medication. The one-month follow-up of the patient after DAPT therapy revealed that the patient did not complain of abdominal pain.

Angiotensin-converting enzyme inhibitors (ACEIs) are recommended in patients with anterior STEMI with heart failure or left ventricular systolic dysfunction. According to observational studies, 20% of patients receiving ACEIs cannot tolerate them because of the side effects of cough and angioedema. Angiotensin receptor blockers (ARBs) can be an alternative to ACEIs in STEMI patients with left ventricular systolic dysfunction or heart failure (Yang et al., 2014). Some studies reported that ACEI had a significantly lower Major Adverse Cardiac Event (MACE) compared to ARBs in patients with STEMI undergoing revascularization who were observed during the two years of the study (Her et al., 2020). In this case report, the patient was given captopril as a vasodilator in patients with anterior STEMI. Captopril is given every 8 hours as an anti-cardiac remodeling, especially to improve ventricular ejection fraction. During treatment in the ward, the patient complained of a cough that might occur due to the side effects of captopril. The patient was then given candesartan as a substitute for captopril, and the cough was reduced. During the one-month follow-up, it was revealed that the patient could tolerate it well.

Angiotensin-converting enzyme inhibitors have been shown to have several beneficial

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effects on heart failure and myocardial infarction outcomes through improving endothelial function, cardiovascular remodeling, and decreasing atherosclerotic processes. Angiotensin receptor blockers have many clinical benefits as ACEIs, but ARBs increase circulating levels of angiotensin II by stimulating the angiotensin II type 2 receptor. Furthermore, activation of the angiotensin II type 2 receptor leads to plaque instability and thrombus formation. Angiotensin-converting enzyme inhibitors suppress the production of angiotensin II, thereby preventing the pathological effects and lowering bradykinin levels, thereby inducing an additional cardiac protective effect. This process may explain the superiority of ACEIs over ARBs in reducing the incidence of MACE, recurrent revascularization, stroke, and rehospitalization due to heart failure in patients with myocardial infarction (Her et al., 2020).

Administration of beta blockers in patients with myocardial infarction will reduce premature death after ACS and the severity of heart failure with low ejection fraction complications. Beta-blockers reduce heart rate and have a negative inotropic effect, reducing myocardial oxygen consumption and decreasing the incidence of chest pain in patients (Noble & Roffi, 2017). Beta-blockers also decrease the incidence of post-infarction arrhythmias and decrease myocardial remodeling. The administration of statins in patients with ACS will reduce mortality and the incidence of ischemic stroke and death of myocardial infarction (Sim et al., 2020). The patient in this case report was given 40 mg of atorvastatin per day during treatment in the Cardiac Care Unit (CCU). Atorvastatin is a drug belonging to the 3-hydroxy-3-methylglutaryl Coenzyme A (HMG-CoA) class, which reduces low-density lipoprotein (LDL) cholesterol levels by reducing endogenous cholesterol synthesis. Statins are used worldwide in patients with hypercholesterolemia and coronary heart disease (Ostadal, 2012). Statins are recommended for primary and secondary prevention and can reduce mortality and cardiovascular events. Statins decrease cholesterol synthesis and produce several isoprenoid metabolites with anti-inflammatory, antithrombotic, and antioxidant properties. Statins can increase the production of nitrite oxide (NO) and reduce endothelial dysfunction (Boekholdt et al., 2014).

On hospital admission, the patient was found to have pneumonia. Pneumonia is the most common cause of hospitalization in adults. About a million adults in the US are hospitalized with pneumonia each year, and about 50,000 die from the disease. Research by Kang (2021), who conducted a cohort study on patients with cardiovascular disease and pneumonia, revealed that pneumonia infection in patients with cardiovascular disease increases the risk of the patient's condition worsening during hospitalization and can lead to high patient mortality rates (Kim, Park, Choi, Seo, & Lee, 2021). The patient in this case report had bacterial pneumonia, characterized by a productive cough with phlegm and increased blood leukocytes and lung infiltration on a chest X-ray. The patient has been given cefoperazone, a third-generation cephalosporin class of antibiotics, effective as empirical therapy for community pneumonia. Sputum culture revealed the presence of *Klebsiella pneumoniae* bacteria, which are sensitive to third-generation cephalosporin antibiotics. Improvement of pneumonia in patients can reduce mortality and shorten the patient's stay in the hospital (Violi, Calvieri, Ferro, & Pignatelli, 2013)

Cardiac rehabilitation in ischemic heart disease has good benefits for patients, reduces mortality from cardiovascular disease, and increases adherence to drug therapy and

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lifestyle modification. Cardiac rehabilitation is recommended for all patients after acute coronary syndrome (El Ouazzani, Ghalem, El Ouazzani, Ismaili, & El Ouafi, 2018). Cardiac rehabilitation after acute coronary syndrome greatly impacts the patient's quality of life and reduces mortality and morbidity ten years after the attack (Sunamura et al., 2018). In patients who did not undergo a cardiac rehabilitation program, only 6MWT was performed, which was used as a reference for an exercise program for four weeks at home during outpatient care after ACS. Lifestyle intervention and control of risk factors are the keys to the long-term therapeutic management of post-myocardial infarction patients. In their meta-analysis, Ji et al. (2019) reported that smoking cessation, routine medication, a healthy diet, measurable and regular physical activity, and good stress management would improve patients' quality of life and reduce mortality and rehospitalization after ACS. Patients are advised to stop smoking, to have a diet according to clinical conditions, to control their blood glucose levels and blood pressure, and to have routine treatment evaluations. These good practices would reduce the incidence of hospitalization, reinfarction, and death in post-myocardial infarction patients (Ji, Fang, Yuan, & Zhang, 2019).

Left ventricular dysfunction is one of the prognostic factors for the survival of patients with coronary artery disease. It was assumed that the dysfunctional myocardium after infarction was permanently damaged. However, recent studies have found that some ischemic tissue remains viable, and contractility can be restored after revascularization (Löffler & Kramer, 2018). Deteriorating left ventricular systolic function due to ischemia is associated with worse clinical outcomes, but not all myocardium improves with revascularization. A viability test assesses whether the myocardium can still function after revascularization (Bhat, Gan, Tan, Hsu, & Denniss, 2016)

Acute and recurrent ischemic events lead to ischemic cardiomyopathy, associated with repeated hospitalizations, poor quality of life, and increased mortality. This process can be reversed if we can identify dysfunctional but viable myocardial cells in patients with ischemic cardiomyopathy. After infarction, the myocardium will show one of 5 pathophysiological conditions: 1) normal myocardial perfusion and function, 2) myocardial ischemia, 3) stunting myocardium, 4) myocardial hibernation, and 5) non-viable infarction. Collateral blood vessels and good coronary microvasculature can maintain myocardial perfusion (Löffler & Kramer, 2018).

Pathophysiologically, myocardial viability refers to living cardiomyocytes, which are determined by the presence of cellular, metabolic, and microscopic contractility functions. Clinically, myocardial viability is defined as a dysfunction of the myocardium at rest but has the potential for functional recovery if vascularity is repaired. Myocardial hibernation was initially thought to be an adaptive process in which the myocardium decreases its contractile function in the presence of decreased blood flow. Myocardial hibernation refers to decreased contractility caused by a transient episode of hypoperfusion. During repeated hibernation, cardiomyocytes undergo structural changes with loss of the contractile apparatus, sarcoplasmic reticulum, T tubules, and an increase in glycogen plaque. These changes eventually become irreversible (García-García et al., 2017).

Viability testing has significant clinical implications. This test can identify dysfunctional myocardium that can restore contractility function and provide information to make decisions about invasive coronary revascularization (Bello et al., 2005). In patients with post-myocardial infarction,

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myocardial scarring is associated with left ventricular remodeling and an increased risk of sudden cardiac death. The hibernating myocardium also provides a substrate for the risk of ventricular tachyarrhythmias (Canty Jr. et al., 2005). Dysfunctional areas with a resting end-diastolic wall thickness of less than 6 mm were considered to reflect significant post-infarction tissue. The tissue showed functional improvement with DSE and showed no improvement after revascularization. The sensitivity and specificity of the DSE range vary between 71–97% and 63–95%, respectively (Maskoun et al., 2009).

The patient in this case report was planned for viability test using DSE. In addition to assessing viability, DSE examination can also assess the presence of post-infarction residual ischemia. MRI, PET, and SPECT examinations can assess myocardial viability but cannot assess the presence of residual ischemia. Treadmill tests can be used to assess the presence of residual ischemia but cannot assess myocardial viability. In addition, the results of the patient's echocardiography showed an ejection fraction of 20%, which was an unacceptable condition for a treadmill test.

CONCLUSION

In this case report, we reported a 62-year-old male patient diagnosed with anterior STEMI with symptoms onset of more than 48 hours based on complaints of chest pain typical of angina and shortness of breath. Electrocardiography showed sinus rhythm, rate of 120 times/minute, normal axis, ST-segment elevation in leads V1-V4 and pathological Q in leads V1-V3, and there was an increase in the enzyme hs-Troponin I. Patients diagnosed with NSTEMI with symptoms onset of more than 48 hours without any complaints of chest pain, stable hemodynamics, and no life-threatening arrhythmias are not recommended for reperfusion therapy. Conservative management and viability testing are the main options for patient management.

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