Extensive anterior myocardial infarction of an older non diabetic patient has better prognosis compared to a younger patient: a case report

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Abstract ST elevation myocardial infarction (STEMI) incidence rates has been decreased inversely to non-STEMI (121 to 77, 126 to 132 per 100.000 case respectively). Diabetes as a risk factors of STEMI is found in 20% patients. The increment of fibrinogen level in diabetic patient may induce compact clots resistance to fibrinolysis that lead to hypercoagulable state problem. Percutaneous coronary intervention (PCI), a non-surgical invasive procedure, can be done to relieve the obstruction. We reported two case reports, patients with anterior extensive STEMI who had underwent primary PCI. Both patients were found a total occlusion at proximal segment of LAD. First case was presented type 2 diabetes mellitus as comorbid while the second case was without diabetes. High burden thrombus was found on the diabetic patient which had poor prognosis, but on the non diabetic patient was found only less thrombus which was more stable condition. There is a strong correlation between type 2 diabetes mellitus and cardiovascular disease (CVD). Glucose control is important for prevention of CVD. Dietary changes that are characterized by increased use of natural sources diets such as whole grains, vegetables, and fruit-based foods and increased physical activity is remarkably strong factors for diabetes prevention.

1. Introduction
Myocardial infarction (MI) is the irreversible heart muscle necrosis caused by the lack of blood supply to the heart due to coronary artery occlusion. The diagnosis was made by the advance examination of a biomarker that detects the acute myocardial injury and ischemia along with the patient's symptoms, changes on electrocardiogram (ECG) result, and imaging evidence. The myocardial infarction usually associated with lack of an anterior wall of heart blood supply by coronary artery.[1]

To make a diagnosis on MI, there must be a history and physical findings that relate to this condition such as chest pain associated with dyspnea, palpitations, anxiety, nausea, vomiting, and diaphoresis. The duration of sickness is also important, along with aggravating functional capacity, and relieving factors, other condition such as diabetes, smoking, hyperlipidemia, hypertension, obesity, previous history of coronary heart disease (CHD) and others must be evaluated either. Laboratorium studies should include troponin, complete metabolic panel, complete blood count, B-type natruretic peptide, and a coagulation profile.[2]

Besides examining the lab studies, the clinician should be aware of patient’s chest X-Ray (CXR) and echocardiography. CXR can help the clinician to diagnose the pulmonary edema that confers to a poor prognosis of disease. Meanwhile, the echocardiography can help the clinician to diagnose acute MI by abnormalities of wall motion and exclude the other causes of chest pain e.g., aortic valve stenosis, aortic dissection, and pericardial effusion. Echocardiogram can measure left ventricle systolic and diastolic function to estimate the prognosis.[2]

Compared with individuals without diabetes, patients with history of diabetic have a two- to fourfold increased risk of CHD.[2] Diabetic patients also have an approximately two-fold higher risk of...
short-term mortality after MI, even after adjustment for the extent of CHD. However, in the thrombolytic era, 90% of diabetic patients will survive beyond the early 30-day period. How diabetes affects the long-term prognosis of these early survivors of AMI is less certain.[3]

The timetable of the factors possible for the poor prognosis among diabetic patients with MI is acted before, during, and or after MI. The factors that can lead to the poor prognosis include autonomic neuropathy, diabetic cardiomyopathy, diffuse coronary atherosclerosis, increased heart rate, impaired pain perception, impaired fibrinolytic function, and thrombus aggregation. Some of these factors are favorably caused by insulin resistance, the MI induce significant increase of adrenergic tone that can lead to lipolysis increasing free fatty acids. Several hormones could also contribute to decreasing insulin sensitivity and glucose uptake in the cell during MI. In the diabetic patient who already has this condition can lead to a very poor prognosis especially on treatment. Fatty acids is obviously harmful to the patient with MI in case of leading the ischemic event. [3,4]

Dietary changes that are characterized by increased use of natural sources diets such as whole grains, vegetables, and fruit-based foods and increased physical activity is remarkably strong factors for diabetes prevention that itself is influenced by behavior. In the discussion section we will describe what kind of diets that meet the criteria to reducing risk factors in diabetes mellitus using natural sources diet.

2. Case Report

Two patients with anterior extensive ST elevation myocardial infarction (STEMI) were admitted to cardiovascular care unit (CVCU) and underwent primary percutaneous coronary intervention (PCI). Both patients were found total occlusion at proximal left anterior descending (LAD) of coronary artery.

The first patient was 47 years old with uncontrolled type 2 diabetes mellitus. Blood glucose examination was 400-500 mg/dl. The patient had a poor prognosis because of a high burden thrombus. We tried to aspirate the thrombus, and it came again, but finally, the thrombus was clear. Drug eluting stent (DES) was implanted at proximal segment of LAD, with the result was TIMI flow 2. During and after the procedure, this patient remained chest pain. We administered nitroglycerine up to 30 µg/minute and morphine bolus up to 5 mg, enoxaparin 0.6 cc subcutaneous twice a day, and intravenous insulin. Unfortunately, the patient died on the third day of admission.

The second patient was 76 years old without diabetes. Coronary angiography showed less thrombus and more stable condition. Both patients were treated with clopidogrel, acetyl salicylic acid, and simvastatin. We successfully performed direct stenting with TIMI flow 3. The symptom was relieved.

3. Discussion

CVD related to atherosclerosis is a major cause of morbidity and mortality in patients with diabetes mellitus. Compared to non-diabetes, patient with diabetes are more likely to have CVD with severe multivessel coronary artery disease. Diabetic patients with CVD have worse outcomes, including lower rates of long-term survival when compared non diabetic. Patient with diabetes is poorly recognized and it is estimated that 5% of the population has undiagnosed diabetes. The incidence of newly diagnosed diabetes varies and has been found in about 5 percent of patients with CVD while other studies have found a higher prevalence of undiagnosed diabetes.[5]

Diabetes is associated with impaired microcirculatory function as manifest by “no reflow” myocardial after percutaneous coronary intervention. Preexisting HbA1c levels and diabetes will cause side effects of hyperglycemia that affect platelet function, fibrinolysis, coagulation, and ischemic preconditions. Myocardial ischemia results in increased rates of glycogenolysis and glucose uptake by translocation of the GLUT-4 receptor to the sarcolemma. Glucose oxidation requires less oxygen than free fatty acid oxidation per ATP molecule produced, myocardial energy is more efficient during increased dependence on glucose oxidation with ischemia. However, with relative insulinopenia, the ischemic myocardium is forced to use free fatty acids instead of glucose as an energy source because myocardial glucose uptake is severely impaired. In this condition, a metabolic crisis may occur as the hypoxic myocardium becomes less energy efficient in the setting of hyperglycemia and insulin resistance.[6]
In this case, we report two cases of patients with anteroseptal MI. Both patients were treated with loading dose acetyl salicylic acid 300 mg, loading dose of clopidogrel 600 mg before PCI procedure. The first case was a 47-year-old woman with uncontrolled type 2 diabetes mellitus. Blood glucose examination was 400-500 mg/dl. The patient had a poor prognosis because of a high burden thrombus. Thrombus aspiration was needed to remove the thrombus, and 1 drug eluting stent (DES) was successfully implanted with TIMI flow 2. During and after the procedure, this patient remained chest pain. We administered nitroglycerine up to 30 μg/minute and morphine bolus up to 5 mg, enoxaparin 0.6 cc subcutaneous twice daily, and intravenous insulin. Unfortunately, the patient died on the third day of admission. The second case was a 76-year-old nondiabetic woman with stable condition. Coronary angiography showed less thrombus with culprit lesion at proximal segment of LAD, one stent DES was successfully implanted with TIMI flow 3. The symptom was relieved.

Figure 1. Thrombotic environment improved in diabetes[6]

Endothelial dysfunction has a significant influence in all stages of the atherosclerotic process. In the early stages, several mechanisms occur such as insulin resistance and increased glucose levels, increased free fatty acids, production of reactive oxygen species (ROS), and reduced nitric oxide (NO) synthesis in several mechanisms including activation of NF-B and protein kinase C (PKC) signaling and reduction of endothelial NO synthase (eNOS) activity. Endothelial dysfunction contributes to the impairment of vasodilation, expression of adhesion molecules, and further vascular inflammation. In the latter stages of the disease, endothelial dysfunction can cause increased platelet activation and a prothrombotic environment which facilitates vascular occlusion and also can cause atherothrombosis (Figure 1).[6]
Figure 2. Thrombosis risk and mechanism in diabetes patient [7].

Diabetes can cause increased of plasma levels of procoagulants and the antifibrinolytic protein levels, including fibrinogen, tissue factor (TF), factor VII (FVII), and plasminogen activator inhibitor-1 (PAI-1) as well as decreased levels of anticoagulants, including thrombomodulin and protein C. Metabolic changes in diabetes also associated with increased platelet activation, reduced nitric oxide (NO) production, increased in reticulated platelets, and increased platelet turnover, that controlled partially by antiplatelet therapy. Fibrin thickening which are resistant to lysis are caused by coagulation proteins qualitative changes including increased oxidation and glycation of fibrinogen, have been reported in diabetes. Increased glycation of plasminogen compromises conversion to plasmin and alters protein activity (Figure 2).[7]

One of the best prevention for type 2 diabetes mellitus is to take a diet rich in whole grains, fruits, vegetables, legumes, nuts, moderate in alcohol consumption, and lower in refined grains, red or processed meats. Sugar-sweetened beverages have been demonstrated to reduce diabetes risk and improve glycemic control and blood lipids in patients with diabetes. Several healthful dietary patterns emphasizing the overall diet quality can be adapted to appropriate personal and cultural food preferences and calorie needs for weight control and diabetes prevention and management. Although considerable progress has been made in developing and implementing evidence-based nutrition recommendations in developed countries, concerted global efforts and policies are warranted to alleviate regional disparities. [8]

To reduce the risk factor of Diabetes mellitus, it is important to use a natural source as a diet for prevention of CHD. There are several ways to prevent diabetes mellitus by taking advantage of natural sources such as limiting red meat consumption, avoiding processed meat, and changing all of those to plant-based food such as fruit, vegetables, whole grains, nuts, legumes, potatoes white flour, and the modest amounts of animal product, avoid sugar-based drinks and choose natural source drink such as mineral water and tea insufficiently. [9]

4. Conclusion
Type 2 Diabetes mellitus accompanied with myocardial infarction is a complex case. It requires good management of glycemic control. Diabetes can cause increased of plasma levels of procoagulants and the antifibrinolytic protein levels, as well as decreased levels of anticoagulants. Those explain why high
burden thrombus often occurs in diabetic patient with myocardial infarction. To reduce risk factor of diabetes mellitus, it is important to use a natural source as a diet for prevention of myocardial infarction by taking fruit, vegetables, whole grains, nuts, legumes, potatoes white flour, and the modest amounts of animal product, avoid sugar-based drinks.

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