CASE REPORT

Acute myocardial infarction after a negative Dobutamine stress echocardiogram in a patient with end-stage liver disease

Khursheed Ahmad[1], Khurram Shahzad[2], Muhammad Muzaffar Mahmood[3]

Abstract

Dobutamine stress echocardiogram (DSE) is generally a safe and reliable test for detection of myocardial ischaemia. We report the case of a 43-year-old male with end-stage liver disease (ESLD), who underwent DSE as part of workup for liver transplantation. Although the patient had an uneventful negative DSE, within 45 minutes he developed inferior ST-segment elevation myocardial infarction (STEMI). His coronary angiography showed severe 2-vessel coronary artery disease, which was treated with percutaneous coronary intervention (PCI) with implantation of drug-eluting stents (DES). Acute coronary syndrome (ACS) after a normal DSE has previously been reported in the literature. We describe one such case, with added complexity of managing an ACS in a patient with high bleeding risk. Our case is unique in reporting a STEMI after a negative DSE in a liver transplant recipient. Increased physician awareness of potential complications of DSE is essential to allow timely recognition and management.

Keywords: Myocardial infarction, Liver transplant, End-stage liver disease, Dobutamine stress echocardiogram, Percutaneous coronary intervention.

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Introduction

Dobutamine stress echocardiogram (DSE) is frequently performed as part of cardiac work up for liver transplant. Acute myocardial infarction (MI) after a negative DSE is an exceedingly rare complication of the procedure. Increased physician awareness is essential to allow timely recognition and management given its potentially serious consequences. Considering the requirement for intensive antiplatelet, antithrombotic, and, in some cases, fibrinolytic therapy after a STEMI, management of patients with high bleeding risk, such as those with end-stage liver disease, can be challenging. We describe one such case of a patient who developed STEMI following a negative DSE and underwent primary PCI with a successful recovery.

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Case Report

A 43-year-old male was referred to our echocardiography laboratory at Ittefaq Hospital, Lahore, in March 2021 for a DSE as part of work-up prior to receiving a liver transplant. His medical history was significant for end-stage liver disease (ESLD) due to Hepatitis-C virus (HCV). He had no history of bleeding or oesophageal varices. He had a 15-pack-year smoking history.

His haemoglobin was 11 g/dL (Normal 17 g/dL), platelet count was 97 109/L (N150-450 109/L), serum creatinine was normal (0.9 mg/dL, N 0.6-1.0 mg/dL), serum albumin was 3.1g/dL (N 3.5-5.2 g/dL), serum alanine transaminase (ALT) was 51 U/L (N <45 U/L), prothrombin time (PT) was 14 seconds (N 11.0-12.5 seconds), and international normalised ratio (INR) was 1.2 (N 09-1.1).

His ECG before the DSE was normal. Resting echocardiogram showed normal left ventricular (LV) dimensions and systolic function with left ventricular ejection fraction (LVEF) of 60% [N >55%]). On escalating Dobutamine protocol infusion, he achieved 100% of the age-predicted heart rate. There was no evidence of new LV regional wall motion abnormalities (RWMA) during the procedure. Appropriate reduction in LV dimensions and augmentation of LV systolic function in response to stress were noted. The patient remained symptom free and no significant ECG changes were seen at peak stress (Figure 1) as well as in the recovery phase.

The patient developed retrosternal chest pain and profuse sweating 45 minutes after the procedure, while sitting in

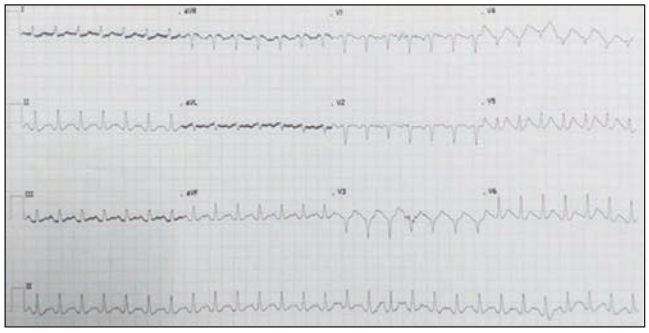

Figure-1: ECG at peak heart rate (158 beats per minute) during the Dobutamine stress echocardiogram showed no significant ST-segment changes.

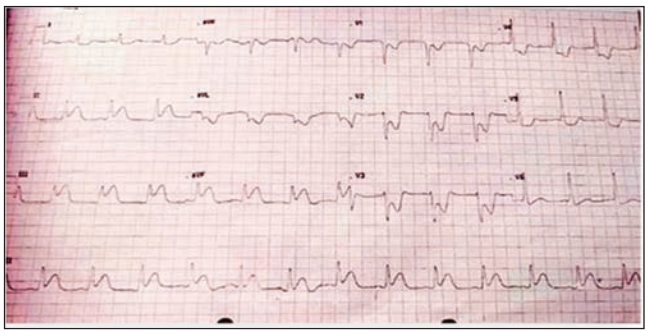

Figure-2: ECG 45 minutes after the DSE; ST-segment elevation in inferior (II, III, aVF) leads with ST-segment depression in anterolateral (I, aVL, V1-V6) suggestive of infero-posterior STEMI.

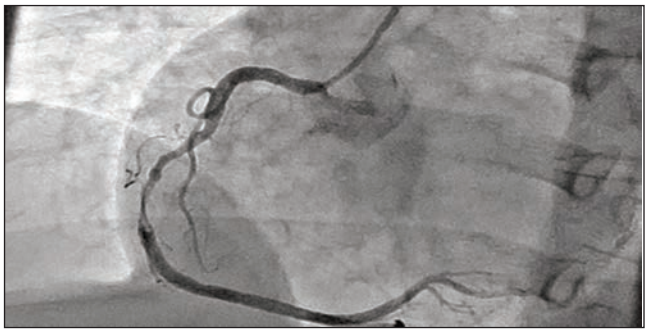

Figure-3: Coronary angiogram; Left anterior oblique view. Right coronary artery (RCA). Severe mid vessel stenosis with intracoronary thrombus.

the waiting area. His heart rate was 80 beats per minute and blood pressure was 137/85 mmHg. His 12-lead ECG showed ST-segment elevation in inferior leads with reciprocal ST-segment depression in anterolateral leads (Figure 2) suggestive of inferoposterior STEMI. His symptoms and ECG changes persisted despite receiving aspirin and intravenous nitrates. Intravenous fibrinolysis was considered to carry higher risks of bleeding in view of his ESLD and emergency coronary angiography was promptly performed. He had a severe stenosis in the middle of his right coronary artery (RCA) with adherent thrombus (Figure 3) and a severe stenosis in proximal left anterior descending (LAD). Clopidogrel 300mg was administered and primary PCI was performed with implantation of a Xience (Abbott Vascular Inc. Santa Clara, California, US) drug-eluting stent (DES) in the RCA. He developed slow-flow during the procedure, which settled with intra-coronary nitrates and a bolus of Glycoprotein (GP) IIb/IIIa inhibitor. Subsequent prolonged intravenous infusion of GP IIb-IIIa inhibitor was avoided in view of good angiographic result and high bleeding risks. Two days later, the patient underwent PCI to LAD and was subsequently discharged home in a stable condition. He was prescribed aspirin and Clopidogrel with an initial plan of dual antiplatelet therapy for three months. The echocardiography prior to discharge showed inferoposterior hypokinesia with mildly impaired LV systolic function. At six-week follow-up the patient is well and symptom free.

Discussion

Our case report highlights many important points. First, even patients with underlying multi-vessel severe coronary stenoses may have a negative DSE, which indicates the limitations of this diagnostic modality. Second, despite STEMI being an exceedingly rare complication of a negative DSE, it is important for physicians to be aware of this potentially fatal complication. Third, in view of the angiographic findings of intracoronary thrombus our case report supports plaque rupture with underlying severe CAD as the mechanism of Dobutamine-induced STEMI. Fourth, in patients with higher bleeding risk, such as our patient with ESLD, treatment strategies to deal with STEMI while minimising the bleeding risks are essential.

Dobutamine, a synthetic catecholamine with a relatively short plasma half-life, has strong β1-receptor, moderate β2-receptor, and mild α1-receptor agonist activity. In DSE, it is used at high doses (incremental dosing at 5-40 ug/kg/min), which induces tachycardia and as a result an increase in myocardial oxygen demand. In the setting of flow limiting coronary stenosis, it reveals wall motion abnormalities indicating the presence of CAD supplying the corresponding myocardium.[1] The overall sensitivity for detection of CAD by DSE has been reported as 61%–96% and specificity as 70%–100%. Therefore, a negative DSE does not exclude CAD.[2]

The reported prevalence of myocardial infarction (MI) with DSE is 0.02% (range 0-0.10%),[3] pointing to its safety. Previous reports of a MI after DSE have proposed various mechanisms, including Dobutamine-induced coronary spasm, spontaneous arterial dissection, and plaque rupture.[4] In our patient, the angiographic finding of a coronary artery stenosis with an overlying thrombus suggests that the shear stress during high dose DSE may have resulted in destabilisation of the plaque with subsequent triggering of the thrombotic cascade.

Cardiac complications are the most frequent cause of mortality after liver transplant. Despite growing evidence of suboptimal performance of DSE in detection of CAD in patients with ESLD, including those selected for liver transplant, high negative predictive value of DSE for subsequent cardiac events has been shown in such patients.[5,6] However, this case, in our view, supports the idea that non-invasive imaging modality such as CT coronary angiography may be a better alternative to DSE for pre-operative evaluation. Clearly more evidence from large case studies is required before any definite

recommendation can be made in this regard.

ACS in patients with ESLD and associated coagulopathy poses a particular challenge owing to the higher bleeding risks from antiplatelet, anticoagulant, and fibrinolytic therapy as well as higher vascular complications from invasive treatment.[7] Mortality after STEMI is higher among patients with cirrhosis as compared to general population. However, a previous analysis has shown improvement in prognosis, which is likely to be secondary to increased usage of PCI over the years.[8]

The higher bleeding risk in patients with ESLD makes fibrinolysis particularly problematic. Major society guidelines prefer primary PCI to fibrinolysis in patients with STEMI.[9] In Pakistan, primary PCI, may not always be promptly available. However, in STEMI patients with higher bleeding risks, primary PCI should be actively sought, while antiplatelet and antithrombotic therapy should be individualised.

In this patient, fibrinolytic therapy was avoided and primary PCI was opted for, while using lower loading dose of Clopidogrel, instead of the usual practice of the more potent antiplatelet therapy with Ticagrelor. While traditionally bare metal stents (BMS) have been preferred in patients with high bleeding risks, more recent guidelines advise using DES as a default strategy.[9] To further reduce the bleeding risk Xience DES was opted for, which has data supportive of shorter DAPT regimen.[10]

In addition, the present case underscores the need for established local testing protocols and formal training in stress echocardiogram to minimise the risk of complications.

Conclusion

Myocardial infarction after a negative DSE is a rare but potentially fatal complication and increased physician awareness is essential. In patients at higher bleeding risk, such as our patient with ESLD, primary PCI is preferred while individualising the choice of DES and antiplatelet and antithrombotic regimen.

Patient consent: A formal consent was obtained from the patient for the publication of this article.

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Conflicts of Interest: None.

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