



# Acute myocardial syndrome in a patient during dobutamine stress echocardiography

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Key Words : Stress Echocardiography, Dobutamine, Acute coronary syndrome

## Introduction :

Stress echocardiography is a diagnostic tool frequently used in daily practice in cardiology to search for myocardial ischemia in patients with an intermediate pretest probability. The occurrence of complications during this exam remains rare. Complications are generally dominated by vegetative disorders and arrhythmias. nevertheless, the occurrence of coronary syndrome remains a dangerous complication, that can be a lethal one, which may occur during this procedure. during this paper, we will objectively look at a clinical case, the probability of occurrence of an acute coronary syndrome during a stress echocardiography as well as the responsible mechanisms of it with a review of the literature including international registers.

## Case report :

We report the case of a 79-year-old patient, known to be diabetic on oral antidiabetics, also followed for well-balanced hypertension on amlodipine, dyslipidemia on statins, operated for hydatid cyst of the liver in 2006, who presented an effort angina initially neglected by the patient. The evolution was marked by the aggravation of the angina of effort becoming class III of the CCS motivating the patient to check with his treating cardiologist who after carrying out ECG and an echocardiography proposed to the patient to carry out a stress echocardiography.

The clinical examination before performing the stress echo was unremarkable with an ECG showing a regular sinus rhythm with an HR of 68 bpm, a 0.5 mm ST segment depression in DIII and negative T waves on the DI and AVL leads. Echocardiography did not show any kinetic disorders with an LVEF maintained at 62%. Stress echocardiography was proposed by his attending cardiologist to look for ischemia.

The stress echocardiography was initiated at rest with an ECG in favor of a negative T waves in AVL with a slight ST segment depression of less than 1 mm with an HR at 68 bpm. The protocol began with 5 gamma of dobutamine with increased heart rate. At the peak of the stress, the patient developed typical constrictive retrosternal pain with profuse sweats alongside an elevation of 2 mm of the ST segment in the inferior territory that persisted even after the recovery phase and an inferior wall akinesia. Given the persistence of pain and elevation of the ST segment; the patient was urgently transferred to the Cardiological Intensive Care Unit and then to the KT lab.

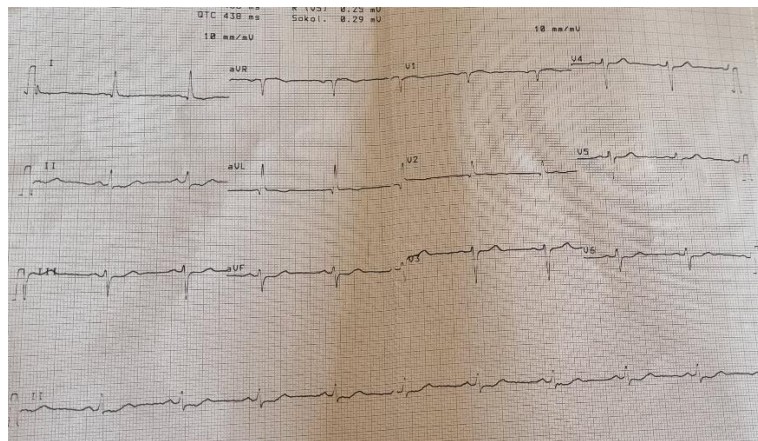


Image 1 : Resting ECG before start of stress echocardiography

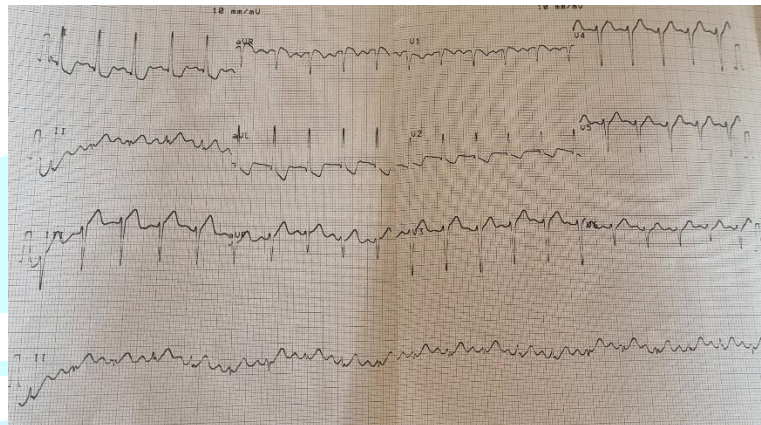


Image 2 : ECG at the peak of the effort at 30 gamma of dobutamine with the appearance of an ST segment elevation in the inferior territory and an ST segment elevation in AVr lead with an anterior and upper lateral ST segment depression

Examination in the cardiological intensive care unit finds an eupneic conscious patient supporting the supine position, suffering, with a BP at 130/78 mmhg with an HR at 71 bpm, well perceived heart sounds at regular rhythm without murmurs or noises added, without signs of right or left heart failure. The biological assessment objectified a HB at 11.0g / dl, GB: 4600 / mm<sup>3</sup>, Plq: 159000 / mm<sup>3</sup>, K +: 4.3mmol / l, creat at 11mg / l, Troponine from 3 times the normal value to 165 time.

The patient was transported within 20min to the cardiac catheterization room where the coronary angiography objectified an acute occlusion of the right proximal coronary artery with a significant thrombotic load . we performed an angioplasty with a successful placement of an active stent of 2.75x26 mm and a good immediate result with a TIMI 3 flow.

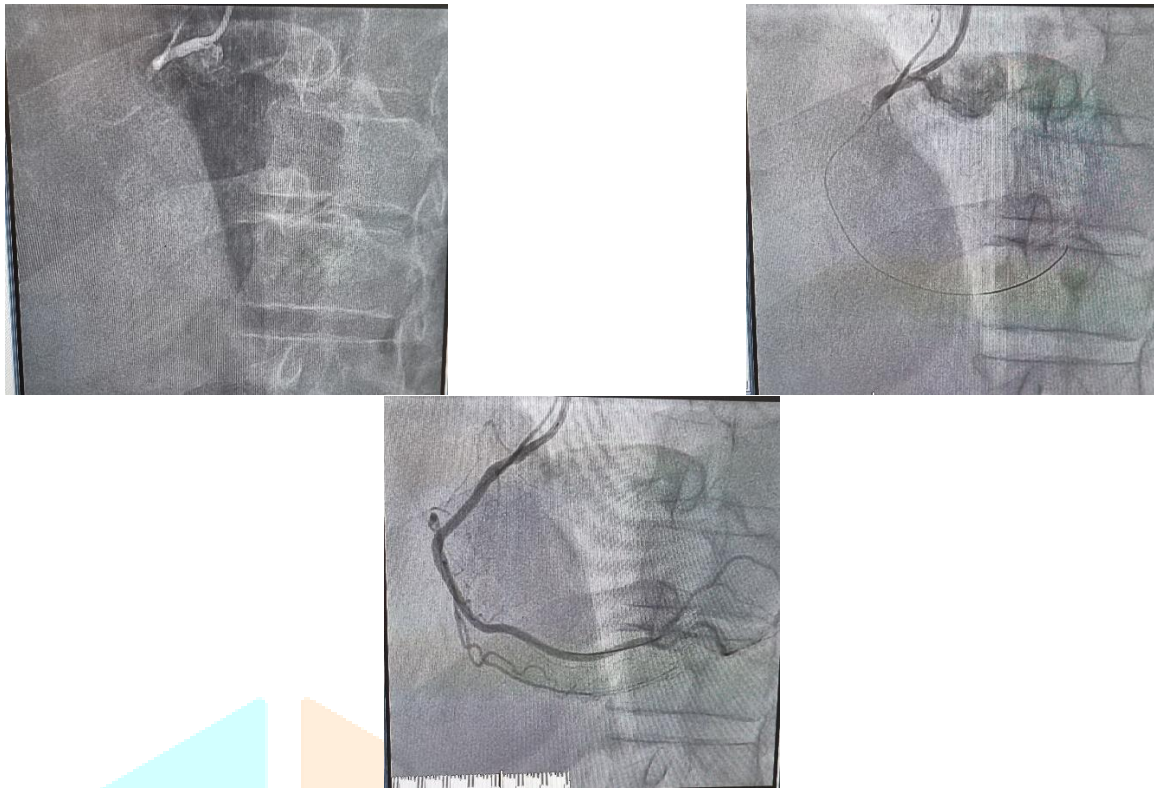


Image 3: Coronarography showing an acute occlusion of the proximal right coronary with final results after angioplasty and placement of an active stent

The evolution was marked by clinical pain regression and regression of ST segment elevation. Echocardiography performed on Day five shows the persistence of akinesia at the level of the inferior wall.

Discussion

Stress echocardiography was initially developed in 1979 for evaluation of patients with known or suspected coronary artery disease. However, this technique is still poorly implemented in many countries and facilities.(1)

Stress echocardiography is the combination of 2D echocardiography with a physical, pharmacological, or electrical stress . The diagnostic endpoint for the detection of myocardial ischaemia is the induction of a transient change in regional function during stress. A transient regional imbalance between oxygen demand and supply usually results in myocardial ischaemia. A typical ‘cascade’ that leads to myocardial infraction strats with Flow heterogeneity, especially between the subendocardial and subepicardial perfusion, followed by metabolic changes, alteration in regional mechanical function, and only at a later stage by electrocardiographic changes and pain.(2) the regional wall function determine the result of a stress echocardiography : normal, ischemic, necrotic, and viable.(2)

Rest	+	Stress	=	Diagnosis
Normokinesis	+	Normo-Hyperkinesis	=	Normal
Normokinesis	+	Hypo, A, Dyskinesis	=	Ischaemia
Akinesis	+	Hypo, Normokinesis	=	Viable
A-, Dyskinesis	+	A-, Dyskinesis	=	Necrosis

Table 1 : Stress echocardiography possible results (2)

Stress is commonly applied to the cardiovascular system pharmacologically, using either dobutamine, dipyridamole, or adenosine, given that physical exercise often induces motion artifacts. Dobutamine stress echocardiography (DSE) is the most commonly used agent given that dobutamine is more convenient, also it yields higher sensitivity and its side effects are relatively controllable compared to other products.(1) Dobutamine stimulates adrenergic receptors and increases O2 consumption.



Ultrasound is a particularly sensitive technique compared to conventional stress testing; it allows faster detection of regional anomalies compared to electrical changes, an evaluation of the coronary territory(ies) concerned, and the extent of the contractile anomalies.

the protocol for the use of dobutamine in stress echocardiography begins with 5 µg/kg/min and increasing to 10, 20, 30, and 40 µg/kg/min. If no endpoint is reached, atropine (up to 1 mg) is added to the 40 µg/kg/min dobutamine infusion.(3)

Whatever the stress protocol, the usual precautions are essential : Blood pressure control, electrical, presence of a practitioner, proximity to a resuscitation room, with emergency trolley and defibrillator. (4)

The different indications for stress ultrasound, as part of the search for ischemia, are the diagnosis of coronary artery disease, prognosis and risk stratification in case of known coronary artery disease, preoperative risk stratification, evaluation of a cardiological cause in the event of dyspnoea, evaluation after revascularization, the location of the ischemia.

Diagnosis of CAD in patients in whom exercise ECG is contraindicated, not feasible, uninterpretable, non-diagnostic or gives ambiguous results
Risk stratification in patients with established diagnosis
Pre-operative risk assessment (high-risk non emergent, poor exercise tolerance)
Evaluation after revascularization (not in the early post-procedure period, with change in symptoms)
Search for viability in patients with ischemic cardiomyopathy eligible for revascularization
Coronary artery disease of unclear significance at angiography or computed tomography

Table 2 : Diagnosis of coronary artery disease in patients in whom exercise ECG is contraindicated, impracticable, uninterpretable, nondiagnostic or gives ambiguous results(2)

Serious complications remain exceptional, particularly for stress echo. Possible risks associated with a dobutamine stress echocardiogram include a Chest pain, Severely high blood pressure, Ventricular and supraventricular Arrhythmias, Dizziness, Nausea and extreme fatigue. And rarely , an acute coronary syndrome.

The occurrence of an acute coronary syndrome during a dobutamine stress echocardiography remains very rare. the incidence of SE-related deaths estimated at < 0.01%, and the incidence of myocardial infarction in the range 0.01–0.1% (5). SE may predispose to AMI by either mechanical means by increased shear forces in the coronary artery resulting in plaque disruption or by a biologic process with direct or indirect effects of dobutamine on thrombus formation by a significant direct platelet activation (6). The degree of this platelet activation is directly related to the administered dose of dobutamine and the duration of administration. The duration of this effect after discontinuation of dobutamine is uncertain, but long enough to explain the occurrence of MI even after discontinuation of the examination. Also, Dobutamine induce an alpha1-mediated coronary vasoconstriction and it is considered a mechanism for developing acute myocardial ischemia during stress Echo.(7)

In the POLSTRESS registry, That included data from 17 university hospitals and large community hospitals in Poland, which performed 4611 SE examinations, including 4408 tests in patients investigated for coronary artery disease and 203 tests to evaluate valvular heart disease . To evaluate CAD, all centres performed dobutamine SE (100%). Only 224 complications occurred at SE examination (4.9% of all tests). Three cases of SE-related myocardial infarction were reported in two (11.7%) centres.(5)

In a UK registry, in about 85 UK centres, the median number of SE examinations was about 400 per Year and a fatal outcome of SE was reported only in one (1.1%) centre, and eight (9.4%) centres reported a case of myocardial infarction due to SE testing.(8)

In a serie by Picano et al. 2,799 dobutamine echocardiography examinations were performed, two cases of IDM were noted(9).in another series by Lewis et al. out of 650 patients who underwent stress echocardiography with dobutamine, two other cases of IDM complicated this examination.(6)

Some rare isolated cases of occurrence of an acute coronary syndrome during stress echocardiography have been reported in the literature. Among them 2 clinical cases.

The first reported by Weidmann and al about a 42-year-old woman in whom acute inferior wall infarction developed 10 minutes after discontinuation of dobutamine stress echocardiography with up to 20 µg/kg/min dobutamine. The

right coronary artery, which had had a 50% stenosis in the prior angiography, showed proximal complete occlusion on the immediately performed recatheterization. Thrombolysis in myocardial infarction study flow grade 3 was rapidly accomplished by intracoronary thrombolysis with recombinant tissue type plasminogen activator.(10)

The second case is reported by Masaaki Takeuchi and al in a 62-year-old patient who presented for atypical chest pain. Two-dimensional echocardiography at rest showed hypokinesis of the basal inferior wall. Wall motion in the other regions was normal. After the administration of atropine (total 0.5 mg) with continuation of 40 µg/kg/min of dobutamine infusion. The patient had severe chest pain with marked ST segment elevation in the precordial and lateral leads. The systolic blood pressure decreased to 70 mmHg and echocardiography showed akinesis of IVS, anterior, and apical walls. and coronary angiography revealed total occlusion of the proximal LAD. In addition, the proximal RCA was totally occluded, and the distal RCA was being filled via collaterals from the LCX.(11)

## Conclusion :

Stress echocardiography is generally a safe exam, however the occurrence of complications is possible, in particular ACS, hence compliance with the indications and contraindications is essential. This exam must be carried out by an experienced practitioner in a structure with the means of resuscitation and a nearby cath lab. Our patient had the indication to carry out an echostress without foreseeable contraindications, nevertheless the occurrence of an acute coronary syndrome in this patient testifies to the improbability of the ischemic complications during this gesture which one can henceforth estimate a daily practice exam with a significant risk of complications.

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