



Assessment of Myocardial Viability with Dobutamine Stress Echocardiography: About 218 Patients

Nahid Erraboun*, Salwa Cheraou, Jihad Raoui, Latifa Oukerraj and Mohamed Cherti

Department of Cardiology B, Mohammed V University, Rabat, Morocco.

ARTICLE INFO

Article history:

Received 3 June 2020;

Received in revised form:
17 July 2020;

Accepted: 28 July 2020;

Keywords

Stress echocardiography (DSE),
Dobutamine stress
echocardiography (DSE).

ABSTRACT

Stress echocardiography (DSE) is an investigative technique that is perfectly integrated into the diagnostic and prognostic assessment of many heart diseases, including coronary disease based on cardiac ultrasound images. Dobutamine stress echocardiography (DSE) is very useful as a first-line test to detect a contractile reserve to better specify the potential benefit of revascularization. This is a retrospective, descriptive and analytical study on patients collected in the laboratory of non-invasive Cardiology explorations hospitalized and/or followed in consultation or referred to the CARDIOLOGY B department IBN SINA university hospital, over a period of 2 years between January 2018 and December 2019. Method: Our service admitted 218 patients for pharmacological stress echocardiography with Dobutamine for viability. The objective of our study is to report the activity of our service concerning the assessment of Myocardial Viability with Dobutamine Stress Echocardiography by specifying the clinical, electrical, echocardiographic and angiographic aspects as well as the results of the stress echocardiography. Men and an average age of 64 years dominated the epidemiological profile of our patients; hypertension is the most common risk factor. Coronary arteriography shows: 43% of our patients had bitruncated coronary lesions. All our patients benefited from the same protocol in the assessment of myocardial viability with low-dose dobutamine stress echocardiography, 46% of viability positive in our series. None of our patients went through complications. These are probably explained by the low doses of dobutamine.

© 2020 Elixir All rights reserved.

I. Introduction

Stress ultrasound is an investigative technique that is perfectly integrated into the diagnostic and prognostic evaluation of many heart diseases, particularly coronary artery disease based on ultrasound cardiac imaging.

Dobutamine stress echocardiography is very useful as a first-line test to detect a contractile reserve in order to better specify the potential benefit of a revascularization.

II Materials and methods

A. Patients and methodology

This is a retrospective, descriptive and analytical study on patients collected in the laboratory of non-invasive Cardiology explorations hospitalized and/or followed in consultation or referred to the CARDIOLOGY B department IBN SINA university hospital, over a period of 2 years between January 2018 and December 2019.

We collected 424 patients in the service of non-invasive operations for a search for ischemia and/or viability with pharmacological stress echocardiography, including:

- 206 patients admitted for ischemia testing;
- 154 patients admitted for viability;
- 64 patients admitted for research and viability and ischemia;
- 218 patients received dobutamine echocardiography for viability.

All our patients underwent careful questioning, a full clinical examination, an electrocardiogram, and monitoring of

hemodynamic and electrical parameters during the examination and during recovery.

B. Examination protocol

All patients underwent stress echocardiography according to the following steps:

1. Before the exam

Preparation and installation of the patient:

- Verification of the equipment of the ultrasound room and the emergency cart.
- Verification of the discontinuation of beta-blockers, bradycardic calcium channel blocker 48 hours before the examination.
- Make a 12-lead electrocardiogram.
- Blood pressure measurement on the right arm if possible (leave the cuff in place for the following measurements).
- Installation of a venous route.
- Placing an electrical syringe with dobutamine and a 5% Glucose serum vein guard, which rinses or accelerates the flow during Atropine or beta-blocker injections.
- Trans-thoracic echocardiography flash.
- Reassure the patient.

2. Protocol

Dobutamine is infused at a progressive rate of 5, 10, 20, 30 mcg/kg per minute; with subsequent administration of atropine in doses of 0.25-0.50 mg for a total of 2 mg to achieve a heart rate greater than 10 bpm than the patient's initial frequency.

3. Examination process

The digital acquisition of the image loops in the 4 usual incidences is made at each level: parasternal short axis cut, apical cut 4 cavities, apical cut 2 cavities, and apical cut 3 cavities.

C Result

The average age of our patients is 64 years old with extremes of 37 and 83 years old. A male predominance of 73% was noted. Almost all of them sick with at least one cardiovascular risk factor: 51.9% of patients with high blood pressure, 46.9% have diabetes, 27.2% followed for dyslipidemia, and 40.7% were smoking. Regarding cardiovascular history: One patient had a history of ischemic stroke and 90% of the patients were known to have an ischemic heart disease of which 18 patients were thrombosed and 30 patients underwent angioplasty.

Clinically: 64% of patients were symptomatic, compared to 36 % asymptomatic. 60% of the patients are dyspneic and 40% suffer from angina.

On the electrical level: The basic electrocardiogram is abnormal in almost all patients.

The electrical anomalies were distributed as follows:

- Q wave of necrosis in 67%
- 28% negative T waves
- Heightening of ST / Left branch block at 45%

Echo-cardio graphic data: All patients had abnormal baseline echocardiography with an akinesia-type kinetic disorder in various territories.

The territories which present an akinesia in the basal state are:

- Left anterior descending artery: 43%
- Circumflex artery: 4%
- Right coronary artery: 9%
- Left anterior descending artery / Circumflex artery: 10%
- Circumflex artery / Right coronary territory: 13%
- Left anterior descending artery / Circumflex artery / Right coronary: 20%

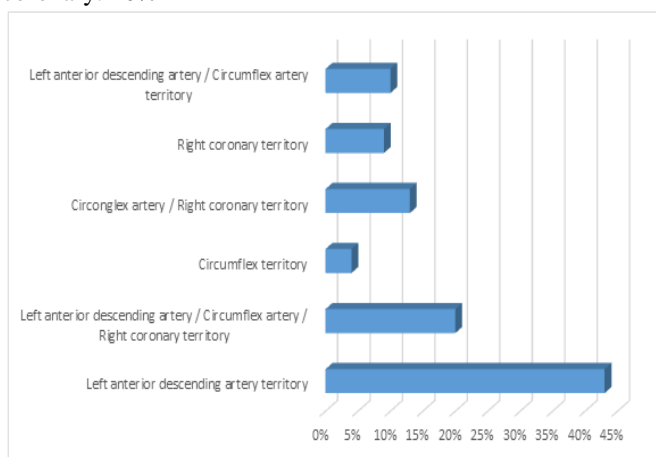


Figure 1. Summary of ultrasound data at baseline.

Protocol

- All patients underwent low-dose dobutamine stress echocardiography for viability.
- 20 gamma in 48% of patients.

We notice: 5 of our patients had a bi-phasic response and one patient had an old apical thrombus.

Viability result

100 patients or 46% of the patients had positive viability in different territories. 66% of the positive viability was in the territory of the left anterior descending.

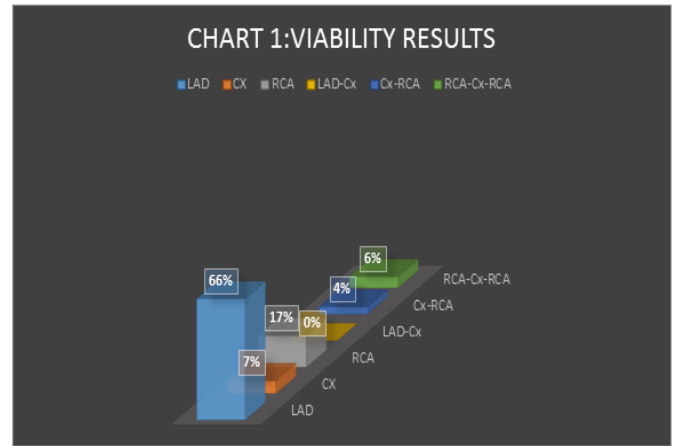


Figure2. Viability results

III Discussion

Viability is defined either in terms of myocardial stunning or in terms of myocardial hibernating. Stunned myocardium is a contractile disorder occurring during an acute episode of ischemia despite a reinstated perfusion. This stunned myocardium usually recovers completely. Hibernating myocardium is ischemic myocardium supplied by a narrowed coronary artery in which ischemic cells remain viable, but contraction is chronically depressed, which may improve after revascularization [1].

The definition of myocardial viability also varies depending on the technique used to demonstrate it. According to the echocardiographer, viability is defined by the presence, within a myocardial zone that malfunctions at rest, of a contractile reserve. The aim is to demonstrate that a resting hypo- or akinetic region is capable, during stimulation, of improving its contractility.

The presence of this contractile reserve should make it possible to say that the myocardial zone is likely to recover a better function after revascularization (surgery or coronary angioplasty) [2].

Advantage of stress echocardiography

Echocardiography is the most accessible, the most suitable technique, and it is widely validated in the study of regional kinetics [3].

And above all, the stress ultrasound, whatever the pharmacological agent used, has consistently and repeatedly shown its superiority in the detection of coronary disease in subjects with intermediate or high risk (evaluated on clinical parameters), comparatively the exercise electrocardiogram [4].

This explains why it is the most used method for viability study in our context.

Our service is the first nationwide to report its DSE activity looking for viability or ischemia.

The protocol carried out during the DSE is the same described in the literature, the improvement in contractility or the contractile reserve are evaluated in response to dobutamine by starting with the first infusion of dobutamine at 2.5 mg/kg/min, with a gradual increase in doses. The wall motion is evaluated at rest and after reaching the desired frequency (10 beats more than the basic frequency) [5].

Results

In our series, the percentage of viability is 46%, this percentage is lower compared to what is reported in the literature; 89% in the Chaudhry series, 67% in the Aferdi series [6], and 81% in the STICH study [7]. This difference can be explained by the delay in taking charge of post-IDM in our context, or by the lack of optimal medical treatment.

None of our patients lived complications during the exam and this can be explained by the low doses of dobutamine used. One patient in our series with an apical thrombus benefited from DSE in search of negative revenue viability.

The presence of apical thrombi raises the concern of systemic embolisms during the administration of dobutamine and therefore the safety of EDS in its patients. An American study (Cusick et al. 1997) made on 102 LV dysfunction patients looking for viability, ischemia and which included patients with apical thrombus, these patients received low doses of dobutamine, and this study did not objectify more rhythmic or thromboembolic complications in this patient's arm, and therefore concluded that even with the lack of information on the safety of EDS in case of apical thrombus, there is no contraindication to the search for myocardial viability at EDS in case of apical thrombus [8].

- Another study (Cusick et al. 2000) of EDS viability involving 80 patients, 68% of whom had apical thrombus, showed that the percentage of viability in the apical segments is lower in patients with a thrombus of the tip[9].

IV. Conclusion

The study of viability is of considerable interest, particularly in the management of ischemic heart disease, and has made it possible to transform the prognosis of certain patients. Indeed, the search for viability seems essential before revascularization, it also makes it possible to predict an improvement in cardiac function.

Reference

1.C. Richard Conti, M.D. The Stunned and Hibernating Myocardium: A Brief Review Division of Cardiology, Department of Medicine, University of Florida College of Medicine, Gainesville, Florida, USA. Clin. Cardiol. 14, 708-712 (1991)

2.S. Ederhy*, L. Soulat-Dufour*, N. Haddour*, F. Boccara*, A. Cohen* Stress echocardiography for the diagnosis of coronary artery disease and for the diagnosis of myocardial viability La Lettre du Cardiologue • n° 475-476 - mai-juin 2014

3.Myocardial viability: dobutamine stress echo- or MRI M.C. Malergue*La Lettre du Cardiologue - n° 408 - octobre 2007

4.Sicari R, Nihoyannopoulos P, Evangelista A et al. ; European Association of Echocardiography. Stress echocardiography

expert consensus statement: European Association of Echocardiography (EAE) [a registered branch of the ESC]. Eur J Echocardiogr 2008;9:415-37.

5. Löffler.A, I.Kramer. Myocardial Viability Testing to Guide Coronary Revascularization. Interventional Cardiology Clinics 2018

6.Imran Afridi, Neal S. Kleiman, Albert E. Raizner, and William A. Zoghbi. Dobutamine Echocardiography in Myocardial Hibernation: Optimal Dose and Accuracy in Predicting Recovery of Ventricular Function After Coronary Angioplasty

7.Velazquez EJ, et al. Coronary-artery bypass surgery in patients with left ventricular dysfunction. STICH Investigators.

8.Cusick. DA, et al. Safety of Dobutamine Stress Echocardiography in Patients with Left Ventricular Apical Thrombus. The American Journal of Cardiology 1997

9.Cusick.DA, et al. Left ventricular apical thrombus and myocardial viability: a dobutamine stress echocardiographic study 2000.