



## Significant Improvement in Severely Stunned Left Ventricle after Percutaneous Coronary Intervention

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### Abstract

*This is a case of severely stunned left ventricle which occurred after a non-ST elevation myocardial infarction in a 76-year-old woman who was a known case of three-vessel disease. Her symptoms and cardiac function responded well to revascularization.*

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**Keywords:** Myocardial stunning • Angioplasty • Ventricular dysfunction

### Introduction

For many years, the functional sequelae of chronic coronary artery disease were considered irreversible; evidence gathered over the past three decades, however, proves that this is not necessarily true.<sup>1</sup> Cardiovascular research has led to the identification of three new and important phenomena: myocardial stunning, myocardial hibernation, and ischemic preconditioning. Myocardial stunning is characterized by transient contractile dysfunction that persists after reperfusion despite the absence of irreversible damage and despite restoration of normal or near normal coronary blood flow. Myocardial hibernation is a condition of sustained reduction of contractile function in hypoperfused but viable myocardium, which recovers completely upon reperfusion. Ischemic preconditioning refers to a phenomenon by which one or more brief periods of myocardial ischemia increases the ischemic tolerance against infarction by endogenous adaptive mechanisms.<sup>2</sup> A number of studies, including non-

randomized studies, have demonstrated that patients with post-ischemic heart failure may derive symptomatic and prognostic benefit from coronary revascularization, and most of this benefit is thought to be derived from the functional improvement of the hibernating myocardium.<sup>1,3</sup>

### Case report

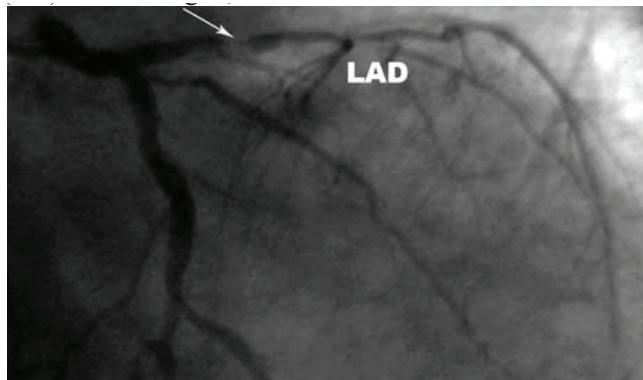
On 27 Oct. 2003, a 75-year-old woman referred to the emergency ward of our hospital for an evaluation of palpitation and chest pain. She was a case of three-vessel disease. A coronary angiography, performed three years previously, had made her a candidate for coronary artery bypass grafting (CABG) but she had refused to undergo surgery. A physical examination revealed rales on pulmonary auscultation and no cardiac murmur. In addition, S4 was

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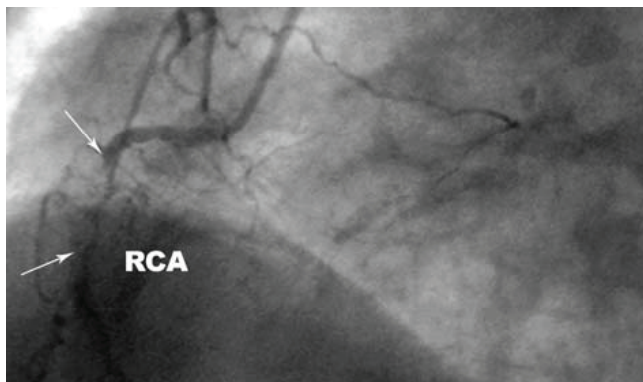
detected. An electrocardiographic study revealed ST depression on leads V4 to V6. An echocardiographic study revealed the following: ejection fraction (EF)=60%, mild aortic valve insufficiency, normal chamber size (end-diastolic diameter=5.0cm, end-systolic diameter=3.2cm), and normal left ventricular systolic function. The patient was discharged nine days later.

On 21 Feb. 2004, she referred to the emergency ward with recent chest pain and dyspnea on exertion. She was admitted with a diagnosis of non-ST elevation myocardial infarction. The findings in echocardiography included: severe left ventricular systolic and diastolic dysfunction (EF=30%, end-diastolic=3.7cm, end-systolic=3cm), anterior and lateral wall hypokinesia, apical akinesia, apicoseptal dyskinesia, mild aortic valve insufficiency, and mild mitral regurgitation.

A coronary angiography showed severe three-vessel disease with the following specifications (Figures 1A, 1B): left anterior descending artery: 95% long calcified stenosis at the proximal third and 50% stenosis at the mid third; left circumflex artery: 80% stenosis after the OM2 ostium,; right coronary artery: cut-off from the proximal portion, retrograde moderate run-off; wall motion abnormality: anterolateral, anteroapical, apical, inferoapical, and mid-inferior akinesia; left ventricular (LV) size: enlarged; and left ventricular EF=20%.



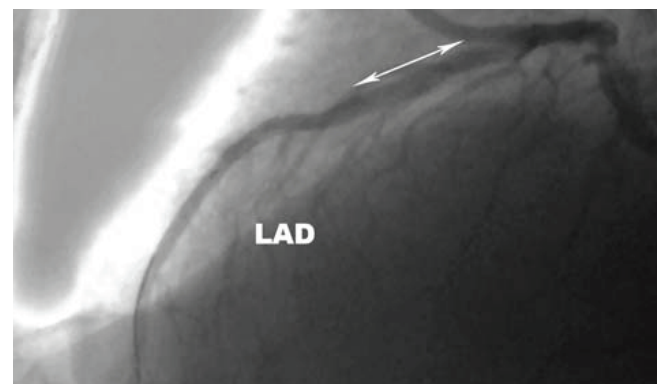
A (Lateral View)



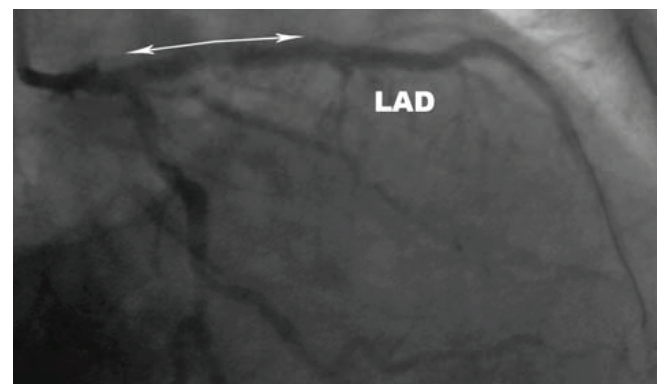
B (RAO Cranial)

Figure 1. Left anterior descending artery (LAD) lesion before stenting (A) and diffuse lesion at the proximal part of right coronary artery (RCA) (B) (arrows) RAO Cranial, Right anterior oblique cranial view

The patient's clinical condition precluded a viability study with myocardial perfusion scan or dobutamine stress echo. Due to the presumed high surgical risk, our cardiac surgeons refused to do CABG and recommended medical treatment. Unable to discharge her from CCU due to her symptoms including both refractory and repetitive chest pain and dyspnea, we opted to perform percutaneous coronary intervention (PCI) as a palliative treatment strategy. The procedure was carried out 17 days after her admission: percutaneous transcatheter angioplasty (PTCA) and primary stenting of the left anterior descending artery with two overlapping bare metal stents AVE-S660 2.75-24 (12 atm) (Medtronic Inc.) and Tron 3-28 (14 atm) (Tron, Pan medical Inc.) were performed. The procedural outcome was successful (Figures 2A, 2B).



A (Lateral View)



B (Lateral View)

Figure 2. Left anterior descending artery (LAD) lesion after stenting (A) and final result after procedure (B) (arrows)

The patient's symptoms were relieved, and 2 days later she was discharged without any complications.

Twenty-seven months later, her cardiac symptoms were relieved significantly. She had no typical chest pain or dyspnea on exertion. Echocardiography was repeated twice and showed: EF=60%, LV size: normal (end-diastolic=5.2cm, end-systolic=3.1 cm), and no regional wall motion abnormality. This is a typical case of severe myocardial stunning recovered by partial percutaneous revascularization.



## Discussion

Coronary artery disease may lead to several serious outcomes including acute myocardial infarction and unstable angina, which were once believed to reflect the irreversible nature of the underlying cause(s). This point of view has been proven to be not necessarily true. Impaired resting left ventricular function due to chronically reduced coronary blood flow reserve that can be restored by revascularization has been attributed to myocardial hibernation.<sup>4-6</sup> Hibernating myocardium is present in approximately one-third of patients with coronary artery disease and impaired left ventricular function.<sup>4</sup> The time course of recovery of hibernating myocardium after revascularization is quite variable, from days to months. Slower recovery is typically associated with a longer duration of hibernation.<sup>4</sup> Data obtained over the past several years have suggested that the restoration of the antegrade flow in the infarct-related artery may improve survival via a mechanism independent of the influence on the left ventricular function.<sup>7</sup>

Our patient suffered from chronic myocardial ischemia, which forced her to refer to the emergency room on two separate occasions within four months. The second time she was referred with a documented non-ST elevation myocardial infarction. She was a known case of three-vessel disease and a candidate for CABG for three years.

In the clinical setting, stunning may coexist with persistently ischemic and infarcting myocardium; the benefit of therapeutic interventions on the stunned myocardium must, therefore, be weighed against potential deleterious effects on the ischemic myocardium. Interventions may be required when myocardial stunning is severe and involves large parts of the ventricle such that the ventricular pump function and the maintenance of adequate cardiac output and blood pressure are jeopardized.<sup>8</sup> A few markers of myocardial viability have been detected through echocardiography and established by coronary angiography.<sup>9</sup>

In our patient, the presence of angina pectoris and absence of Q waves on the ECG and a history of prior myocardial infarction were useful clues in favor of hibernation. She responded to revascularization well; her symptoms relieved noticeably and her cardiac function improved significantly.

## Conclusion

The recognition of viable myocardium in a patient with LV dysfunction and symptoms of LV failure should prompt rapid revascularization. It is advisable that one not be disappointed when facing a falling ejection fraction; one should regard it as heart failure and bear it in mind that revascularization by PCI or CABG could cause significant improvements in the patient's outcome.

## Acknowledgement

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