Relationship between Myocardial Blush Grade and LV Function in Acute MI Patients after Primary PTCA

Morteza Safi, MD and Farah Naghashzadeh, MD

Abstract

Background- The primary objective of reperfusion therapies for acute myocardial infarction is not only to restore the blood flow in the epicardial coronary artery but also to complete and sustain the reperfusion of the infarcted part of the myocardium.

Methods- In this cross-sectional study on 50 patients who underwent primary coronary angioplasty, we assessed the correlation between LV ejection fraction and angiographic evidence of myocardial reperfusion (myocardial blush grade). The myocardial blush grade after the angioplasty procedure was graded by two investigators, who were otherwise blinded to all clinical data. On the 5th day after MI, left ventricular ejection fraction was assessed by 2D echocardiography (Simpson's method).

Results- This study showed that the myocardial blush grade was directly related to the left ventricular function. Ten patients had MBG 0-1, 21 patients had MBG 2, and 19 patients had MBG 3, the mean ejection fraction being 42±12.2 %. Severe LV systolic dysfunction was found in six patients, moderate LV systolic dysfunction in 24 patients, and mild LV systolic dysfunction in 14 patients; and the remaining 6 patients had normal LV function. Multivariate analysis showed that there is a direct correlation between MBG and LV function ($R=0.77$, $p<0.01$).

Conclusion- In patients after reperfusion therapy, the myocardial blush grade as seen on the coronary angiogram is a predictor of left ventricular function and can be used to describe the effectiveness of the myocardial reperfusion ***(Iranian Heart Journal 2006; 7 (4):13-16)***.

Key words: myocardial blush ■ ejection fraction ■ myocardial infarction coronary angioplasty

Over the past decades, great efforts have been made to improve the outcome of patients with acute MI.[1-4] Many trials have relied on mortality as the end point.[1,2] The recent data from the global utilization of streptokinase and tissue plasminogen activator for occluded coronary arteries (Gusto) trial suggest that patency of the epicardial-related coronary artery is an appropriate alternative end point.

However, the primary objective of reperfusion therapies is not only to restore the blood flow in the epicardial coronary artery but also to complete and sustain the reperfusion of the infarcted myocardium. A simple clinical tool that describes the effectiveness of myocardial reperfusion is lacking, because non-invasive means so far have not been applicable in routine clinical practice, and the widely-used angiographic parameter, thrombolysis in

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From Shaheed Beheshti Cardiovascular Research Center, Shaheed Modarres Hospital, Saadat-Abad 19714, Tehran, Iran.
Tel: 2083106 Fax:2074101 Email: info@sbcvrc.org
Address for correspondence: Morteza Safi MD, Assistant Professor, Cardiovascular Research Center, Shaheed Beheshti University of Medical Sciences, Tehran, Iran. Tel: 2083131 Fax: 2083131

myocardial infarction (TIMI) flow grade, describes epicardial instead of myocardial reperfusion: the myocardial blush grade.
To describe the effectiveness of myocardial reperfusion, we used the myocardial blush grade; and to validate this new tool, we compared myocardial blush grades with left ventricular function in patients after primary coronary angioplasty.

Methods

In this cross-sectional study from September 2002 to February 2005, 100 patients underwent primary PTCA. In about half of the patients, angiographic data were missing. The remaining 50 patients formed the basis of this report.
The myocardial blush grade (MBG) was graded on the angiograms made immediately after the primary coronary angioplasty procedure by two investigators who were blinded to all data apart from the coronary angiogram.
In each patient, the best projection was chosen to assess the myocardial region of the infarcted coronary artery, preferably without super positioning of the non-infarcted myocardium.
Angiographic runs had to be long enough to allow some filling of the venous coronary system, to be certain of adequate contract filling of the epicardial coronary artery.
All angiograms were made with 7F and 8F guiding catheters in a standardized fashion.
MBG was defined as follows:
Grade 0 indicates no contrast density; grade I indicates minimal contrast density; grade II indicates moderate contrast density; and grade III indicates normal contrast density.
When the myocardial blush persisted (staining), this phenomenon suggested leakage of the contrast medium into the extravascular space and was graded as 0.
Before the patients were discharged, left ventricular ejection fraction (LVEF) was measured by 2D echocardiography (modified Simpson) by a single operator, who was blind to the angiography results.
Good LV function was defined as EF≥55%, mild LV systolic dysfunction as 40≤EF<55%, moderate LV systolic dysfunction as 30≤EF<40%, and severe LV systolic dysfunction as EF<30%.

Statistical analysis

In our presentation of the data, continuous baseline variables are given as mean±SD, whereas discrete variables are given as absolute values, any percentage.
In 50 patients, MBG and LVEF were obtained, and a multivariate logistic correlation analysis was performed to determine the correlation between MBG and LV function.

Results

The myocardial blush grade could be assessed in 50 patients. Angiographic characteristics of the patients clarified by MBG are shown in Table I.
MBG 0-1 was present in 20% of patients, MBG 2 in 42% of patients, and MBG 3 in 38% of patients.
Mean EF was 42.6 % ± 12.2%. Six patients had severe LV systolic dysfunction, 24 patients had moderate LV systolic dysfunction, and 14 patients had mild LV systolic dysfunction; the remaining 6 patients had good LV function.
Using Spearman's method in statistical analysis revealed that there was a direct and strong correlation between MBG and EF ($r = 0.78$, $p < 0.01$).
Also in the patients who had LAD lesions there was a strong and direct correlation between EF and MBG ($r = 0.76$, $p < 0.01$). It is the same result in the group of patients with RCA lesions.

Conclusion

In patients after reperfusion therapy, the myocardial blush grade as seen on the

coronary angiogram is a predictor of left ventricular function and can be used to describe the effectiveness of the myocardial reperfusion. We can conclude that culprit vessels do not have any influence on our results and for every type of coronary lesion the blush grading helped us to correctly determine the reperfusion of endangered myocardium.

There was a correlation between myocardial blush grade and LVEF; the higher the blush grade, the better the LVEF.

Table I. EF and MBG after primary PTCA

	EF				MBG		
	good	mild	mod.	severe	0-1	2	3
Frequency	6	14	24	6	10	21	19
Percent	12.0	28.0	48.0	12.0	20.0	42.0	38.0
Total (n)	50				50		
Total (%)	100.0				100.0		

Discussion

The principal finding of our study is that in patients after primary angioplasty for acute MI, myocardial perfusion, as described by the MBG, is reflected by the damage to the infarcted myocardium, as is evident from 2D echocardiography.

The myocardial blush grade can, therefore, be used as a predictor of clinical outcome. Several studies have shown that myocardial perfusion can be assessed visually with intracoronary injection of sonicated micro-bubbles during echocardiography in the catheterization laboratory. This technique has been used to describe the effectiveness of myocardial reperfusion and predict clinical outcome. Myocardial contrast echocardiography can be used to categorize patients as having reflow or no reflow, and it has been shown that even in the presence of TIMI 3 flow in the epicardial coronary artery, a patient may have no-reflow into the myocardium.

We studied the angiographic MBG based on visually-assessed contrast density in the infarcted myocardium after reperfusion therapy.

The angiographic myocardial blush grades are analogous to the TIMI grade for flow in the epicardial infarct-related coronary artery.

This information can be obtained during high-quality coronary angiography and can be used to describe the effectiveness of reperfusion therapies.

High MBG predicts adequate myocardial reflow shortly after epicardial coronary reperfusion, and is an accurate indication of regional and overall functional recovery in patients with acute MI. The inter-observer variability, associated with subjective angiographic assessments, is certainly a limitation of the myocardial blush grade.

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