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Patency of infarct related artery after pharmacological reperfusion during transfer to primary percutaneous coronary intervention influences left ventricular function and one-year clinical outcome

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Abstract

Background: Time-to-treatment is an important determinant of mortality in primary angioplasty for ST-segment elevation myocardial infarction (STEMI). Thus, the benefits in outcome observed with transferring for primary angioplasty in comparison with on-site thrombolysis may be reduced or even lost when long-distance transportation is required. Even though pharmacological reperfusion might overcome this limitation, no data have been reported so far on the prognostic role of early pharmacological recanalization in STEMI patients undergoing long-distance transportation for primary angioplasty.

Methods: We enrolled 225 consecutive STEMI patients without shock, eligible for thrombolysis, with at least 90-minute transport time to our primary PCI center. During transport, patients received i.v. heparin 40 U/kg, alteplase 15 mg+35 mg infusion and abciximab 0.25 mg/kg+0.125 μg/kg/min infusion for 12 h.

Results: Patients were divided into two groups according baseline angiography, which showed early pharmacological reperfusion (preprocedural TIMI flow 2+3) in 193 patients (85.8%) and no reperfusion (preprocedural TIMI flow 0+1) in 32 patients (14.2%). Despite no difference in postprocedural TIMI flow, early reperfusion was associated with better postprocedural myocardial perfusion (TMPG 3: 54.9% vs. 18.7%, $p<0.0001$), better improvement in left ventricular ejection fraction (LVEF) (from 55.6±8.6% to 58.8±10.4% $p<0.001$ with early reperfusion vs. 52.9±13.4% to 50.4±15.8% with no early reperfusion, p=NS) and 1-year outcome ($p=0.002$ log rank). In multivariate analysis, preprocedural TIMI flow 0+1 independently predicted death and reinfarction at 1 year, and lack of LVEF improvement at 6 months.

Conclusions: Early pharmacological reperfusion in STEMI patients undergoing long-distance transportation for primary angioplasty is associated with better postprocedural myocardial perfusion, better LVEF recovery at 6 months and improved 1-year clinical outcome.

Keywords: Myocardial infarction; Networking; Fibrinolysis; Reperfusion; Infarct related artery; Facilitated PCI

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1. Introduction

Recent trials have demonstrated that even patients transferred for primary percutaneous coronary intervention (PCI) from a non-invasive to invasive center have superior outcomes in comparison to those treated with thrombolysis at the site of presentation if the transfer is accomplished rapidly and the door-to-balloon time is not excessive (<90 min) [1,2]. However, a large number of ST-elevation myocardial infarction (STEMI) patients still present initially in areas where transfer times are prohibitively long. We have previously demonstrated acceptable safety and feasibility of pharmacological pretreatment (thrombolysis and abciximab) of patients transferred to our center from remote hospitals with transfer time >90 min [3]. The present study evaluates the impact of such early pharmacological reperfusion preceding primary PCI on left ventricular function and 1-year outcome.

2. Methods

The study was approved by the Institutional Review Board. All patients gave informed consent and the study conformed to applicable institutional and national guidelines for research on human subjects, as well as to the Declaration of Helsinki. Patients presenting with STEMI to community hospitals without catheterization laboratories were enrolled if: (1) they presented with non-shock acute myocardial infarction (onset of chest pain <12 h earlier and ST elevation > 1 mm in 2 contiguous electrocardiographic leads) to the emergency department of a hospital without a catheterization laboratory; (2) they had no contraindications to thrombolytic therapy and were <75 years of age; and (3) if anticipated transfer time to the interventional center was >90 min.

Table 1
Characteristics of the study population

	TIMI 0+1 (n=32)	TIMI 2+3 (n=193)	p
Age (years)	59.6±8.6	56.6±9.5	NS
Sex (males) (%)	78.1	76.2	NS
History of CAD (%)	50	44	NS
Prior myocardial infarction (%)	21.9	13	NS
Diabetes mellitus (%)	9.4	10.9	NS
Arterial hypertension (%)	53.1	51.8	NS
Hypercholesterolemia (%)	75	73.1	NS
Smoking (%)	50	73.1	0.009
History of PCI (%)	0	0.5	NS
History of CABG (%)	0	0.5	NS
Killip Class 3+4 in cath lab (%)	15.6	13	NS
SBP on admission (mm Hg)	132±20	130±23	NS
DBP on admission (mm Hg)	80±11	80±15	NS
Heart rate on admission	83±11	78±15	NS
IRA LAD (%)	28.1	43.5	NS
IRA Cx (%)	18.8	11.4	NS
IRA RCA (%)	53.1	45.1	NS
Stent implantation (%)	53.1	45.1	NS
Multiple vessel disease (%)	46.9	50.3	NS

CABG — coronary artery bypass graft, CAD — coronary artery disease, DBP — diastolic blood pressure, IRA — infarct related artery, PCI — percutaneous coronary intervention, SBP — systolic blood pressure.

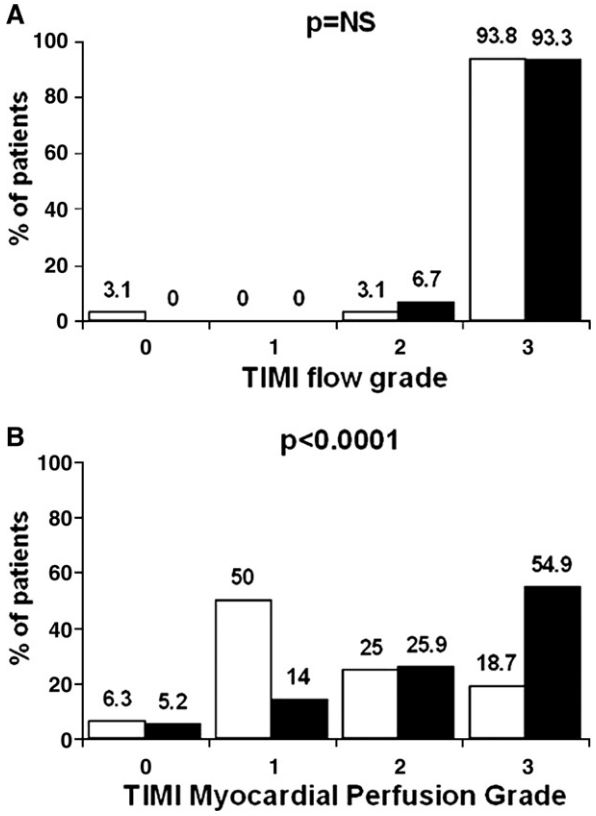

Fig. 1. Angiography after PCI. TIMI flow grade in the infarct-related artery (A) and TIMI Myocardial Perfusion Grade (TMPG), in the myocardial area subtended by the infarct-related artery (B). Subgroup TIMI 0+1 (occluded infarct-related artery at initial angiography before PCI) = empty bars. Subgroup TIMI 2+3 (patent infarct-related artery at initial angiography before PCI) = solid bars.

After phone contact with the primary PCI center, consecutive patients were enrolled and started on a combination thrombolytic treatment in a community hospital prior to transfer to the primary PCI center. They received heparin 40 U/kg (maximum 3000 U), alteplase (r-tPA) 15 mg and abciximab 0.25 mg/kg (intravenous bolus), followed by intravenous infusion of alteplase (35 mg for 60 min) and abciximab (0.125 μg/kg/min over 12 h). Abciximab infusion was continued throughout transfer, intervention and recovery. All patients received aspirin (100–350 mg) upon first presentation. The loading dose of 300 mg of clopidogrel was administered in all patients in the cath lab before angiography.

Left ventricular ejection fraction (LVEF) was assessed by echocardiography (SONOS 5500 Agilent Technologies Inc.) according to modified biplane Simpson rule [4] using the apical two-chamber and four-chamber views within 2 to 3 days after the onset of chest pain (baseline) and at 6 months. Analysis of all angiograms was performed in an independent core laboratory (Krakow Cardiovascular Research Institute, Krakow, Poland) by an experienced analyst blinded to treatment and outcome, utilizing NewQuant32 software package (Sanders Data Systems, Palo Alto, CA,