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# Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION



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# Circulation

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Volume 108 ■ Number 2  
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The cover figure is from the image in this issue by Firschke et al. Figure 1. Contrast-enhanced CT scan of the aortic arch. See p e14.



# Mechanical Prevention of Distal Embolization During Primary Angioplasty

## Safety, Feasibility, and Impact on Myocardial Reperfusion

Ugo Limbruno, MD, PhD; Andrea Micheli, MD; Marco De Carlo, MD; Giovanni Amoroso, MD, PhD; Roberta Rossini, MD; Caterina Palagi, MD, PhD; Vitantonio Di Bello, MD; Anna Sonia Petronio, MD; Gabriella Fontanini, MD; Mario Mariani, MD

**Background**—Effective myocardial reperfusion after primary percutaneous coronary intervention (PCI) may be limited by distal embolization. We tested the safety, feasibility, and efficacy of the FilterWire-Ex (FW), a distal embolic protection device, as an adjunct to primary PCI.

**Methods and Results**—Fifty-three consecutive patients undergoing primary PCI with FW protection were compared with a matched control group treated by primary PCI alone. Successful FW positioning was obtained in 47 patients (89%) without complications. Histological analysis of the content of the last 13 filters showed multiple embolic debris in all cases. FW use was associated with lower postinterventional corrected TIMI frame count ( $22 \pm 14$  versus  $31 \pm 19$ ;  $P=0.005$ ) and higher occurrence of grade 3 myocardial blush (66% versus 36%;  $P=0.006$ ) and early ST-segment elevation resolution (80% versus 54%;  $P=0.006$ ). At multivariate analysis, FW use was the only independent predictor of early ST-segment elevation resolution and of grade 3 myocardial blush. FW patients showed lower peak creatine kinase-MB release ( $236 \pm 172$  versus  $333 \pm 219$  ng/mL;  $P=0.013$ ) and greater improvement at 30 days in left ventricular wall motion score index ( $-0.30 \pm 0.19$  versus  $-0.18 \pm 0.26$ ;  $P=0.008$ ) and ejection fraction ( $+7 \pm 4\%$  versus  $+4 \pm 7\%$ ;  $P=0.012$ ).

**Conclusions**—FW use during primary PCI is feasible and safe. Distal embolization prevention appears to exert a beneficial effect on markers of myocardial reperfusion and on left ventricular function improvement at 30 days. (*Circulation*. 2003;108:171-176.)

**Key Words:** myocardial infarction ■ angioplasty ■ embolism ■ reperfusion

Signs of microvascular hypoperfusion after successful primary percutaneous coronary intervention (PCI) have been observed in up to 80% of cases according to the marker used to assess effective reperfusion, such as angiographic myocardial blush, resolution of ST-segment elevation, or myocardial contrast echocardiography.<sup>1-6</sup> This occurrence, named “no-reflow,” is associated with poorer functional recovery and adverse outcome.<sup>7</sup> Distal embolization of thrombus/plaque components during primary PCI may play a crucial role in limiting effective myocardial reperfusion<sup>8-10</sup>; thus, it can be hypothesized that mechanical prevention of distal embolization might prevent no-reflow during primary PCI.

The FilterWire-EX (FW) is a 0.014-inch guidewire that incorporates a nonoccluding polyurethane porous membrane filter (80- $\mu$ m pores) in the shape of a windsock to allow retention and removal of embolized particles. The filter can be delivered and retrieved through a 3.9F monorail sheath.

We here report on the safety and feasibility of the adjunctive use of the FW during primary PCI performed on native coronary arteries for acute myocardial infarction. The impact of FW use on myocardial reperfusion was compared with a case-matched control group.

### Methods

#### Patient Population

Fifty-three consecutive patients with acute myocardial infarction were included in the study and subjected to primary PCI with the FW after written consent was obtained. The inclusion criteria were as follows: (1) presentation within 6 hours from symptom onset; (2) chest pain lasting >30 minutes and resistant to intravenous nitrates; (3)  $\geq 0.2$ -mV ST-segment elevation in at least 2 contiguous leads on a 12-lead ECG; (4) infarct-related native artery with a reference lumen diameter >3.0 mm and with a Thrombolysis In Myocardial Infarction trial (TIMI) flow grade <3. Although FW use is recommended for coronary diameters ranging from 3.5 to 5.5 mm, the inclusion criterion was extended to vessels >3.0 mm because

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