Do Not Pass Flow: Microvascular Obstruction on Cardiac Magnetic Resonance after Reinfarction Following Primary Percutaneous Coronary Intervention

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CASE PRESENTATION

A 69-year-old man with a history of coronary artery bypass presented to the emergency department with ischemic chest pain. Initial surface electrocardiography (ECG) revealed an acute inferolateral ST elevation myocardial infarction. The patient received emergent primary percutaneous coronary intervention (PCI) with a drug-eluting stent to a proximally occluded posterolateral branch of a large dominant right coronary artery (RCA). Reperfusion was successful (Figure 1 A), and his symptoms resolved. Nine hours later, he returned to the cardiac catheterization laboratory due to recurrent chest pain and more pronounced inferolateral ST elevations on ECG. He was found to have an acute reinfarction, with an occluded RCA just proximal to the stented artery and a high thrombus burden along the entire vessel (Figure 1 B). Percutaneous intervention was unsuccessful, and he was not deemed to be an appropriate candidate for repeat surgical revascularization.

Cardiac magnetic resonance (CMR) imaging for viability 6 days after his initial procedure revealed characteristic findings of microvascular obstruction in the basal to mid-inferior wall. Specifically, imaging after gadolinium-based contrast injection during late inversion recovery sequences showed a hypoenhanced zone within a full-thickness transmural infarct (Figure 2). There were two characteristics that differentiated it from a thrombus: (1) it was confined within the myocardium, and (2) the hypoenhancement on repeat imaging decreased over time from contrast administration, with gradual penetration of contrast into the damaged microvasculature.

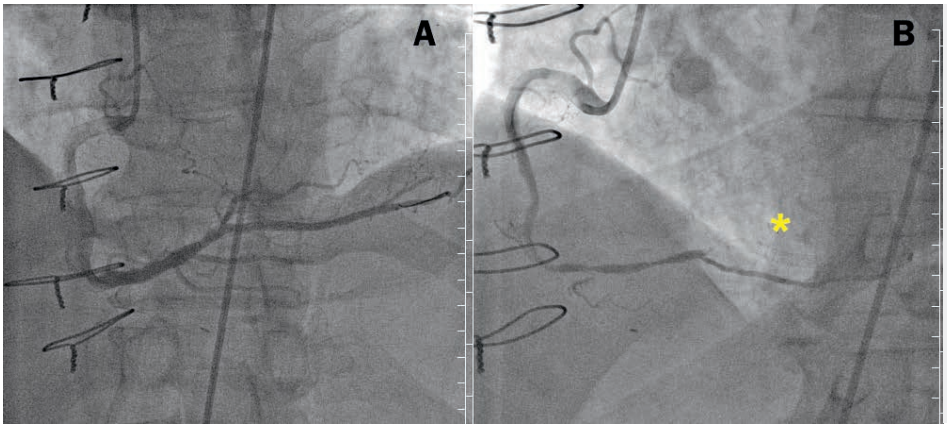

Figure 1.
Coronary angiograms in right anterior oblique projections demonstrate (A) successful perfusion of a culprit right posterolateral branch artery immediately after primary percutaneous coronary intervention, and (B) occlusion of the right coronary artery shortly thereafter. The coronary stent is visible (asterisk).

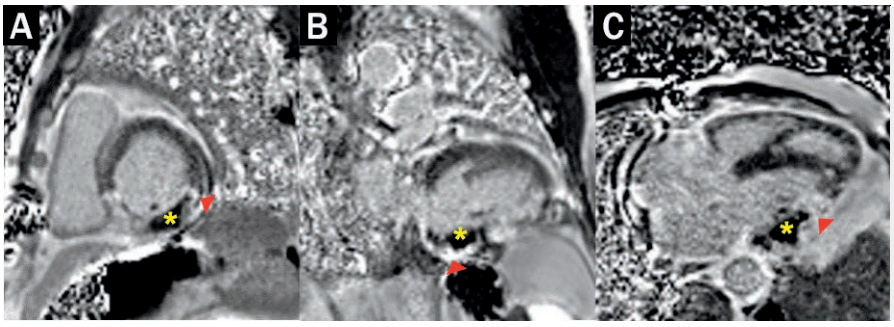

Figure 2.
Phase-sensitive inversion recovery cardiac magnetic resonance applied to late gadolinium enhancement in (A) short axis midpapillary, (B) 2-chamber, and (C) 3-chamber views demonstrate hypoenhanced inferior and inferolateral microvascular obstruction zones (asterisks) surrounded by hyperenhanced infarct (arrowheads).

Microvascular obstruction is characterized by damage and dysfunction of the myocardial microvasculature, resulting in a "no-reflow" phenomenon in which blood flow cannot penetrate beyond the myocardial capillary bed.[1] CMR is currently considered the superior noninvasive imaging modality for detecting microvascular obstruction. More than half of STEMI patients successfully reperfused with PCI have been shown to have microvascular obstruction.[2] Its ominous prognostic significance as a predictor of adverse left ventricular remodeling, major adverse cardiac events, and cardiac death incremental to infarct size is well established.[2,3]

Conflict of Interest Disclosure:
The authors have completed and submitted the *Methodist DeBakey Cardiovascular Journal* Conflict of Interest Statement and none were reported.

Keywords:
no reflow, cardiac magnetic resonance, microvascular obstruction, late gadolinium enhancement

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