

A Novel Acute Collateral Flow Index Explains Lack of Long-term Benefit of Collaterals during AMI

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Introduction: The Rentrop grading scale to evaluate degree of collaterals on angiography has recently been shown to be also valid in occluded coronary arteries during acute myocardial infarction (AMI).

Patients and Methods: We measured pressure distal to coronary artery occlusions (Pd) in 111 patients admitted for AMI, 67 (61%) treated by primary PCI. Patients were followed for 60 months. The conventional CVP-based formula to calculate collateral flow index yielded values considerably higher than those in elective patients. This unreasonable finding, and the fact that left ventricular mean diastolic pressure (LVMDP) is markedly higher than CVP during ischemia whereas the reverse is true in its absence, prompted the derivation of a modified formula. Since coronary perfusion occurs mostly during diastole, this LVMDP-based formula is more pertinent in AMI when LVMDP is the dominant pressure limiting collateral flow.

Results: This novel acute collateral flow index (ACFI) yielded an ACFI of 0.18 ± 0.17 (median-0.15) when the ischemic threshold value is 0.25. Pd and ACFI correlated with Rentrop collateral grade ($p < 0.0001$). Lower creatine kinase levels were measured in the higher ACFI tertile compared with lower tertile group ($p < 0.003$). However, no difference in early global or regional left ventricular ejection fraction or in mortality during a 60-month follow-up was observed.

Conclusions: The ACFI that correlated with both Pd and the Rentrop grade is a better guide than conventional index to evaluate collateral function during acute ischemia. Collateral flow during AMI may marginally limit the immediate myocardial damage but does not affect left ventricular ejection fraction or long-term mortality. This is probably because of the low flow provided by emerging collaterals soon after occlusion that does not preclude ischemia and the high proportion of patients undergoing a coronary intervention within a few hours of onset before any collateral effect can be realized.