The Regional Myocardial Flow–Function Relationship

A Framework for an Understanding of Acute Ischemia, Hibernation, Stunning and Coronary Microembolization

Gerd Heusch

Correlation Between Acute Reductions in Myocardial Blood Flow and Function in Conscious Dogs

Vatner SF


This pioneering article was the first to quantitatively relate regional myocardial blood flow (microspheres) to regional contractile function (sonomicrometry). Regional flow and function were more or less proportionately reduced during acute ischemia in conscious dogs.

The notion that myocardial ischemia arises from an imbalance between oxygen demand and supply goes originally back at the illustrious past of Circulation Research, we hope to promote a deeper appreciation of the contributions of this journal to the advancement of knowledge.
dissociation of normalized or only slightly reduced blood flow and persistent, yet reversible, contractile dysfunction during reperfusion after myocardial ischemia, that is, perfusion–contraction mismatch. Stunning is a result of increased formation of reactive oxygen species and calcium overload during reperfusion, which impair excitation–contraction coupling. It seems that long-term hibernation develops from cumulative episodes of acute stunning in a continuum that is initially characterized by a mismatch of flow and function (as in acute stunning) and then progresses into a new match (as in short-term hibernation). Another manifestation of perfusion–contraction mismatch arises from spontaneous or interventional coronary microembolization, where blood flow is normal or slightly elevated (reactive hyperemia), but contractile function is severely depressed as a result of patchy microinfarcts and an inflammatory reaction with cytokine-induced and reactive oxygen species-mediated impairment of the contractile machinery.

Perfusion–contraction match and mismatch are not only of conceptual academic interest, but have also become important criteria in modern cardiovascular imaging to guide decisions on coronary revascularization. As one sees from the references, most of the original studies in the field have been reported in Circulation Research and much of the conceptual debate has happened here. The current editor is the best guarantee that Circulation Research will continue to be the forum for integrative hemodynamic research as it has been under his predecessor, whose classic article I have had the pleasure to comment on.

Disclosures

None.

References

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