Microvascular dysfunction in acute coronary sydromes and heart failure: what is essential is invisible to the eye?

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In the past decade, several preclinical and clinical studies have clearly demonstrated that coronary microvascular dysfunction (CMD) plays a key role in several cardiovascular diseases. In particular, CMD is the main contributor to myocardial ischemia in a large subset of patients with chronic stable angina, acute coronary syndromes and heart failure. Indeed, non-obstructive coronary atherosclerosis is observed in up to 50% of patients with anginal symptoms and positive stress test results, undergoing diagnostic coronary angiography and is associated with worse clinical outcome than that observed in asymptomatic subjects with a similar burden of risk factors. A parallel "tale" could be told regarding patients with ST-segment elevation myocardial infarction (STEMI) or with heart failure (HF) with preserved ejection fraction (HFpEF). In the first scenario, coronary microvascular obstruction (CMVO) negates the beneficial effects of a successful revascularization in up to 50% of patients; in the second case instead, the diagnosis of HFpEF is based on the following: 1) typical symptoms of HF, 2) typical signs of heart failure, 3) a non-dilated left ventricle with normal or only mildly reduced EF, 4) relevant structural heart disease (i.e. left ventricular hypertrophy, left atrial enlargement) and/or diastolic dysfunction. As with MVA or CMVO, patients with HFpEF have a worse clinical outcome compared with asymptomatic subjects exhibiting a similar burden of risk factors and/or clinical presentation.

As a matter of fact, In both MVA and HFpEF no treatment focused on CMVO has hitherto been proved to consistently improve clinical end-points in controlled randomized trials testing one single approach against, probably due to the multiple mechanisms of CMD operating over time. The prevention and treatment of CMD would lead to a reduction of post-myocardial infarction HF with high socioeconomic impact on the health system (due to less re-hospitalization and less overall costs for drug or device therapies for HF) and on patient's quality of life (less invalidating symptoms that usually limit working capacity and patient welfare). Furthermore, HFpEF is frequently associated to other chronic diseases. The clustering of comorbid conditions is typical of the elderly. Thus, prevention and treatment of CMD by reducing the burden of HF might also reduce the global comorbid burden of elderly patients.