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Complete revascularisation should be immediate in STEMI: pros and cons

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Introduction

Multivessel coronary artery disease often occurs in patients presenting with ST-segment elevation myocardial infarction (STEMI). Current European guidelines on acute coronary syndromes (ACS) recommend complete revascularisation in such patients, but there is no consensus on the optimal timing. As such, percutaneous coronary intervention (PCI) of the non-infarct-related arteries (IRAs) can be performed either immediately (i.e., during the primary PCI) or in a staged (i.e., within 45 days) procedure. Although an immediate complete revascularisation can reduce the use of contrast medium and radiation and can be more practical in off-hours procedures, there are factors that favour a staged approach, including the high thrombo-inflammatory burden, an impaired evaluation of non-IRAs and the lack of information about patient history and comorbidities. Both these strategies have pros and cons, and the optimal timing for complete revascularisation remains a subject of debate.

Pros

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Primary PCI with treatment of the culprit lesion is the standard of care for patients with STEMI[1]. Existing evidence supports the benefits of complete revascularisation (CR) over culprit lesion-only PCI in STEMI with multiple vessel disease (MVD)[2], and current guidelines give it a Class I recommendation[1]. Although there is broad agreement that CR is the best strategy for patients with STEMI and MVD, there is no general consensus on when to perform non-culprit PCI in relation to the index procedure/hospitalisation. Until recently, direct comparative evidence between an immediate and a staged CR strategy was lacking. Plausible benefits of immediate CR include pacification of vulnerable plaques, which are more common in non-culprit lesions in the setting of acute cardiovascular thrombo-inflammation in STEMI, and avoidance of repeat hospitalisation, with a reduction in costs and patient inconvenience. On the other hand, immediate CR is considered to be associated with increased contrast use, higher radiation doses and can be a greater challenge for the cath lab team in off-hours procedures. Therefore, the 2023 European Society of Cardiology (ESC) Guidelines for the management of acute coronary syndromes are not specific about the optimal timing of PCI of non-culprit lesions in STEMI patients and recommend that it should be performed either during the index procedure or within 45 days[1].

The results of 2 randomised controlled trials (RCT) directly comparing immediate and staged CR in ACS patients with MVD have recently been published[3,4]. The definition of CR included treatment of all lesions with angiographic diameter stenosis ≥70%. Patients with cardiogenic shock, previous coronary artery bypass surgery and chronic total occlusions were excluded from these trials[3,4]. The 1-year primary endpoint included death from any cause, non-fatal myocardial infarction, stroke and unplanned ischaemia-driven revascularisation in both trials[3,4] and hospitalisation for heart failure in

the MULTISTARS AMI trial[4]. Functional assessment of stenosis or intravascular imaging was used in 10-20% of patients, more frequently in the staged CR arm. The total contrast volume, radiation dose/time, procedural time, and length of hospital stay were greater in the staged CR group.

The BIOVASC trial included the full spectrum of patients with ACS, and STEMI was present in approximately 40% of the 1,525 patients enrolled. Off-hours procedures were performed in 28% of patients, and CR was achieved in 96% of cases. The median time to staged procedure was 15 (25th, 75th percentiles: 4-28) days. At 1 year, there were no significant differences in major bleeding or all-cause mortality (1.9% in the immediate CR group and 1.2% in the staged CR group)[3].

The MULTISTARS AMI trial looked specifically at the role of immediate CR in STEMI patients (n=840). Additional exclusion criteria for this trial included left main lesions and severe renal insufficiency. The median time to staged intervention was 37 (30-43) days. Procedural success was achieved in 91% of patients. The incidence of acute renal failure or need for renal replacement therapy was approximately 3% and was not significantly different between the two groups. At 1 year, there were no significant differences in major bleeding and all-cause mortality (2.9% in the immediate CR group and 2.6% in the staged CR group)[4].

As shown in the random-effects model in **Figure 1**, a significant 38% reduction in the risk of the primary endpoint was achieved with the immediate CR strategy. Reductions in the incidence of recurrent myocardial infarction, mostly periprocedural, and unplanned revascularisation were the main drivers of the observed benefit. Notwithstanding the limited diagnostic accuracy of recurrent infarction in acute STEMI compared with later stages, both trials clearly show that there is at least no trade-off in outcomes when CR is performed immediately, with all the aforementioned advantages in terms of logistics, cost and patient convenience. Another recent RCT, the FIRE trial, showed that an immediate CR strategy is feasible, safe and effective, even in patients aged 75 years or older[5].

In summary, no RCT is a substitute for careful clinical assessment and treatment decision-making for the individual patient. However, the new evidence presented in 2023 provides sufficient support for immediate CR as the preferred revascularisation strategy in the majority of patients with STEMI and MVD.

Conflict of interest statement

A. Kastrati and T. Kessler are inventors of the drug-eluting stent-related patent application PCT/EP/053116.

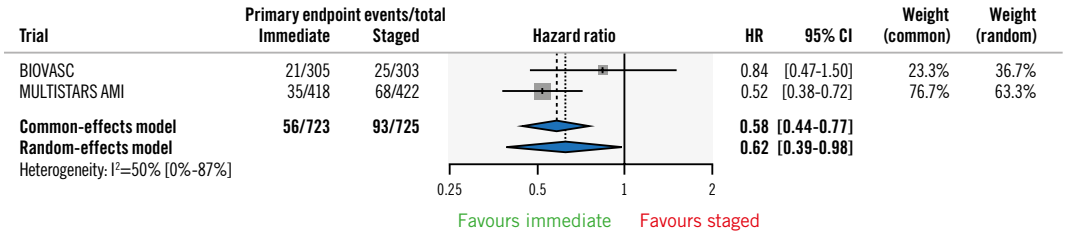

Figure 1. *Pooled analysis of the primary endpoint in the 2 randomised trials specifically comparing immediate versus staged complete revascularisation. Only the STEMI subset of the BIOVASC trial was included in this analysis. CI: confidence interval; HR: hazard ratio; STEMI: ST-segment elevation myocardial infarction*

Cons

Salvatore Brugaletta, MD, PhD; Riccardo Rinaldi, MD

The latest ESC Guidelines on acute coronary syndrome recommend considering routine complete revascularisation in multivessel disease STEMI patients within 45 days, but there is no clear statement about whether it should be performed immediately after culprit lesion treatment or later, either before or after hospital discharge[1]. Nonetheless, in ACS patients presenting with cardiogenic shock and multivessel disease, current guidelines clearly recommend immediate treatment of the culprit lesion and staging PCI of non-IRA later. This recommendation is based on the results of the CULPRIT SHOCK trial, which showed a higher 30-day incidence of all-cause mortality or renal-replacement therapy with an immediate complete revascularisation strategy compared to a staged one[6].

On top of these data, there are several points to bear in mind against an immediate complete revascularisation for multivessel STEMI **(Figure 2)**.

Firstly, it is well known that there is a certain degree of vasoconstriction in the acute phase of STEMI which may lead to an overestimation of coronary stenosis and potential implantation of unnecessary stents that are smaller than required which, in turn, may generate subsequent clinical events.

The second point concerns how to decide, at the time of the acute procedure, whether non-IRA lesions should be treated. This decision is then based on the limited data usually available at this time concerning the patient's clinical history (such as previous angina episodes, left ventricle ejection fraction, etc.); furthermore, physiological indices (e.g., fractional flow reserve) in STEMI's acute phase have very little value and are not recommended at all by the 2023 ESC ACS Guidelines[1].

The third point relates to antiplatelet therapy. Although new-generation drug-eluting stents are generally safe with low rates of thrombosis[7], even the most potent oral antiplatelet agents require time to achieve optimal platelet inhibition: performing immediate complete revascularisation for STEMI may imply working in a suboptimal antiplatelet scenario.

Last, but not least, embarking on complex PCI procedures (bifurcation, chronic total occlusion, long and calcified lesions) in the acute phase immediately after recanalisation

of a thrombotic lesion delays intensive care treatment, with no data demonstrating that the extra time and effort spent on additional PCI may translate into a clear clinical benefit in terms of strong endpoints such as mortality or recurrent myocardial infarction.

Conflict of interest statement

S. Brugaletta serves on the advisory board of Boston Scientific and Zoll; and has received speaker's fees from Abbott Vascular, GE HealthCare, and Siemens. R. Rinaldi has no conflicts of interest to declare.

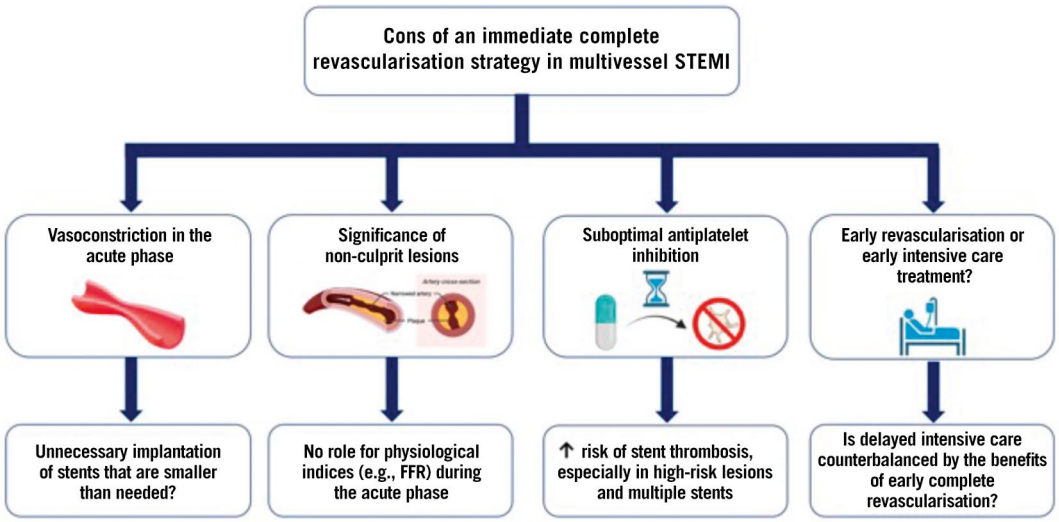

Figure 2. *Cons of an immediate complete revascularisation strategy in multivessel STEMI. FFR: fractional flow reserve; STEMI: ST-segment elevation myocardial infarction*

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