

# Complete revascularisation in patients with acute myocardial infarction: is renal function the lock and patient selection the key?



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Multivessel coronary artery disease (MVD) is a common clinical condition in patients undergoing percutaneous coronary intervention (PCI) for ST-segment elevation myocardial infarction (STEMI). To be precise, up to 65% of patients with STEMI have angiographically significant lesions beyond the culprit lesion causing the acute event<sup>1</sup>, which are typically a matter of debate in clinical practice. They may represent stable coronary plaques, with limited expected benefit from preventive revascularisation unless the subtended territory is relevant. On the other hand, lesions with the angiographic appearance of unstable plaques may trigger future events, and PCI in such non-culprit lesions may confer a prognostic benefit. Importantly, intravascular imaging may add further information to the clinical decision making<sup>2</sup>, and the indication for non-culprit vessel PCI should be based on physiological measures rather than on plain angiography<sup>3</sup>.

Multicentre randomised trials have suggested that complete revascularisation reduces adverse outcomes<sup>4</sup>. However, the debate is still open as to whether revascularisation should be completed in a staged procedure, to allow complete recovery (either before or after discharge), rather than to pursue it in a single session for

the convenience of the patients and for economic efficiency<sup>5,6</sup>. Each trial (**Table 1**) demonstrated a consistent reduction in the composite ischaemic endpoint with a small number needed to treat (NNT). This was mainly driven by a lower number of softer events such as the need for urgent or subsequent revascularisation, but the pooled estimate (n=6,114 patients) shows a signal of reduced mortality (HR 0.75, 95% CI: 0.51-1.10, personal calculation). European guidelines now suggest considering completion of revascularisation in patients with STEMI and MVD before hospital discharge.

In the current issue of EuroIntervention, Song et al<sup>7</sup> present a nationwide four-year prospective comparison of Korean patients with severe chronic kidney disease (CKD) receiving multivessel or culprit-only PCI for acute myocardial infarction and MVD.

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In their final sample consisting of 326 propensity-matched patients, they found that the risk of one-year MACE was similar. Interestingly, at sensitivity analysis, the incidence of MACE was higher in patients with STEMI receiving multivessel intervention (adjusted HR 1.90, 95% CI: 1.12-3.22, p=0.017).

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**Table 1. Multicentre randomised trials of complete versus IRA-only revascularisation in patients with STEMI.**

Trial	N	Mean age (years)	Data about patients' renal function	Definition of significant non-IRA lesion	Timing of non-IRA PCI	Median follow-up duration	Hazard ratio for the primary composite endpoint (95% CI)	NNT	Components of the primary or secondary endpoints with $p < 0.05$
PRAMI ( <i>N Engl J Med</i> 2013)	465	62.0	Not reported	Angiographic DS $\geq 50\%$	Index PCI	23 months	0.35 (0.21–0.58)	7	Non-fatal MI. Refractory angina. Repeat revascularisation.
CvLPRIT ( <i>J Am Coll Cardiol</i> 2014)	296	65.0	GFR $< 30$ mL/min/1.73 m <sup>2</sup> in 0.7% patients	Angiographic DS $\geq 70\%$	Index PCI or staged PCI before discharge	12 months	0.45 (0.24–0.84)	9	None
DANAMI-3-PRIMULTI ( <i>Lancet</i> 2015)	427	63.5	Patients with renal impairment were excluded	FFR $\leq 0.8$	Staged PCI 2 days after the index PCI	27 months	0.56 (0.38–0.83)	11	Ischaemia-driven revascularisation. Urgent and non-urgent PCI.
Compare-Acute ( <i>N Engl J Med</i> 2017)	885	61.5	Renal impairment in 1.1% patients	FFR $\leq 0.8$	Generally during index PCI, preferably within 3 days	12 months	0.35 (0.22–0.55)	8	Revascularisation by PCI. Any revascularisation.
COMPLETE ( <i>N Engl J Med</i> 2019)	4,041	62.0	Chronic renal insufficiency in 2.1% patients	Angiographic DS $\geq 70\%$ or FFR $\leq 0.8$	Staged PCI before discharge or within 45 days after discharge	36 months	0.51 (0.43–0.61)	13	CI for secondary efficacy outcomes have not been adjusted for multiple comparisons

CI: confidence interval; DS: diameter stenosis; FFR: fractional flow reserve; HR: hazard ratio; IRA: infarct-related artery; MI: myocardial infarction; NNT: number needed to treat; PCI: percutaneous coronary intervention

How can these data be reconciled with the current evidence in favour of multivessel intervention in patients with STEMI and MVD in the light of the largest study to date, the recently published COMPLETE trial<sup>6</sup>?

It should not be unexpected that patients with severe renal dysfunction and MVD did not receive a benefit from complete revascularisation over a one-year period. This is probably inherent with the high burden of comorbidities and the high risk of adverse events of patients with severe CKD, which in itself is a powerful predictor of early negative outcomes independently from the completeness of revascularisation (overall MACE and mortality rates were 40.8% and 27.6%, respectively)<sup>7</sup>. In addition, the theoretical advantages of multivessel PCI in patients with severe CKD may be offset by a higher risk of periprocedural and post-procedural complications<sup>8</sup>: patients receiving multivessel PCI had a trend towards worsening of renal function (adjusted OR 2.13, 95% CI: 0.98–4.67)<sup>7</sup>. On the other hand, as the decision for complete revascularisation was made on a selective clinical basis, we might speculate that a selective strategy of complete revascularisation in patients with severe CKD is safe, although apparently useless. Also, taking into account the prospective cohort design of the study<sup>7</sup> and the small final sample size, as compared with the available randomised trials (Table 1), the actual interaction between procedures and outcomes cannot be clearly ascertained.

However, the authors should be commended for their attempt to fill a major gap in knowledge in a very high-risk population (notably, mean age and eGFR were 75.4 years and 19.1 mL/min/1.73 m<sup>2</sup>, respectively)<sup>7</sup>. Elderly patients with such advanced CKD are mostly unrepresented in trials of complete

revascularisation (Table 1), and the recently published CULPRIT-SHOCK trial demonstrated that single session complete revascularisation in patients with cardiogenic shock leads to an early excess in adverse renal outcomes and mortality<sup>9</sup>. Therefore, it is intuitive that patients with severe CKD are particularly prone to adverse outcomes<sup>10</sup> after having received complex multiple PCI, especially if they are haemodynamically unstable.

Given the lack of randomised data, which will hardly ever be available, clinical judgement<sup>3</sup> plays a central role in the decision making regarding whether to proceed to multivessel PCI in patients with acute myocardial infarction and severe CKD. Although some tight non-culprit lesions might prompt early treatment<sup>6</sup>, anatomical and functional data should be weighed against the high frailty of these patients.

### Conflict of interest statement

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