Non-culprit lesion percutaneous coronary intervention during acute myocardial infarction – the road not taken?

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In this issue of "Postępy w Kardiologii Interwencyjnej/Advances in Interventional Cardiology" journal, 1 case report and 1 original article present one of the most hotly debated dilemmas in the current practice of interventional cardiology – the optimal revascularization approach for patients undergoing primary percutaneous coronary interventions (PPCI) for myocardial infarction (MI) and found to have multivessel coronary artery disease (CAD).

The case report by Wolny *et al.* describes the clinical course of a patient who was admitted directly to the catheterization laboratory due to an inferior wall ST elevation MI (STEMI), as a first presentation of CAD. On angiography, the patient was found to have a two-vessel CAD – an occlusive lesion in the distal right coronary artery (RCA), the culprit lesion in the infarct-related artery (IRA) this context, and a second lesion in the proximal left anterior descending artery (LAD) with involvement of the 1st diagonal branch (the non-IRA lesion) without obstruction of the coronary flow. The patient underwent successful PPCI of the culprit lesion, with resolution of symptoms, and was admitted for continued care, but a few hours later developed anterior MI due to thrombotic occlusion of the LAD stenosis, not treated during the PPCI.

This case raises the obvious question – could the 2nd MI have been avoided by preventive stenting of the non-IRA lesion during the PPCI? The answer to this question is not clear. Currently, such patients present major dilemmas for the interventional cardiologist: patients with multivessel CAD comprise over half of the STEMI population, and their prognosis is worse, compared to patients with single vessel disease [1]. Considering the well-established prognostic benefit from achieving complete revascularization (or at least "reasonable" incomplete revascularization) [2, 3] in CAD patients, it is obvious that the optimal goal is a more aggressive approach leading to more complete revascularization. The question at hand is the optimal timing of revascularization for non-IRA lesions.

Current guidelines [4] based upon a firm base of evidence from large observational studies (in a field that until recently was seriously lacking in randomized trials) [5], which found a significant increase in adverse outcomes for patients undergoing multivessel PCI in the setting of acute MI, recommend a restrictive approach that discourages treatment of non-IRA lesions during the index PCI, unless the patient is in cardiogenic shock. This dogma has been challenged in recent years by evidence from randomized trials [6, 7], which found significant reductions in composite ischemic endpoints, when performing "preventive" multivessel revascularization during STEMI.

In spite of the impressive results from these trials, it should be remembered that the PRAMI trial [6] has been criticized for having been stopped prematurely due to a much higher than expected treatment effect and the achieved statistically significant results with a relatively small number of clinical events raises concerns of a chance finding amplified due to the early termination of the trial. The CvLPRIT trial [7] was not able to show reductions in "hard" endpoints, and the benefit in the composite endpoint was solely driven by repeat revascularizations. Perhaps the most interesting and relevant trial in this field to date is the PRIMULTI trial [8], recently presented at the American College of Cardiology annual conference, which represents a middle ground between the guideline-recommended culprit lesion only approach and the en vogue preventive PCI strategy – early (i.e., within the same hospitalization) staged PCI, an approach whose advantages over preventive PCI have previously been suggested by a post hoc analysis of the

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HORIZONS-AMI trial [9], in this case (the PRIMULTI trial) integrated with fractional flow reserve (FFR) evaluation of the non-IRA lesions.

The drawbacks of multivessel interventions during PPCI – most notably prolonging procedural time and contrast exposure, putting the patient at increased risk for procedure-related complications, and overestimation of the severity of non-IRA lesions, leading to unnecessary stenting – should not be forgotten. And perhaps an interim approach, as shown in the PRIMULTI trial, combines the best of all worlds – leaving the patient with as complete revascularization as possible, while avoiding the hazards of multiple interventions in the acute setting.

As demonstrated very vividly by the case report at hand, each choice has its drawbacks. Hopefully, more definite answers to the dilemmas presented by this case will be given by larger RCTs due to be published during the coming years, most notably the COMPLETE (NCT01740479) and COMPARE-ACUTE (NCT01399736) trials. Until the results of such trials are revealed, caution needs to be exercised and the risk benefit profile for the individual patient contemplated prior to performing multivessel interventions in the setting of STEMI.

The article by Siudak *et al.* represents a commendable attempt to gain insight into a related, although far less prevalent dilemma – how to treat multiple lesions within the IRA. Their registry (CORAMI) is the first attempt to prospectively evaluate the different approaches to these lesions (i.e. complete IRA revascularization vs. culprit lesion only revascularization), and although the authors had to change the design of the trial from a multicenter randomized trial to a registry due to a slow recruitment rate, their results are interesting and warrant attention: a consistent trend in favor of the culprit lesion only approach was found for both in-hospital (mortality, stent thrombosis, angiographic complications and urgent repeat revascularizations), and 12-month (mortality, stent thrombosis, MI and urgent repeat revascularizations) outcomes. Although the results did not reach statistical significance due to the low sample size, the absolute margin in outcomes is quite impressive and definitely clinically significant. The most plausible explanation for these findings, suggested by the predominance of stent thrombosis among the clinical outcomes, is stenting of non-significant lesions, due to overestimation of their severity during the acute MI phase, a consequence that may have been avoided by using a more methodical process for the evaluation of non-culprit lesions, such as FFR or intravascular ultrasound (IVUS). Another important lesson to be learned from the results of the CORAMI registry is the increased risk for procedural complications when performing multiple interventions during acute MI – as is evident from the almost doubling of the rate of angiographic complications, a lesson that definitely extends to treatment of non-IRA lesions as well.

The results of the CORAMI registry reported by Siudak *et al.* should be viewed in two perspectives:

1. As a hypothesis generating data for the planning of future trials investigating the issue of treating multiple lesions within an IRA in the setting of MI.
2. As another reminder of the hazards of multiple coronary interventions in the acute PPCI setting, an issue more important to remember considering the recent trend towards a more aggressive and complete revascularization approach in patients with multivessel STEMI.

Hopefully, this project will be ongoing and supply us with future data from a larger sample size to gain more knowledge as to the risks and benefits of multiple coronary interventions during acute MI, to help clinicians make informed and evidence-based choices as to the optimal treatment for these high-risk patients.

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth.

Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,

And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I –
I took the one less traveled by,
And that has made all the difference.

Robert Frost – The Road Not Taken, Mountain Interval, 1916.

Conflict of interest

The authors declare no conflict of interest.

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