

Study shows benefits to treating all clogged arteries at once after heart attack

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Patients experiencing a major heart attack often have more than one clogged artery, but under current guidelines doctors typically only clear the blockage responsible for the heart attack. Assessing and, when warranted, treating the additional blockages can improve patient outcomes and reduce the need for subsequent invasive procedures, according to research presented at the American College of Cardiology's 66th Annual Scientific Session.

The study's findings are in line with previous studies pointing to benefits of a more comprehensive treatment approach after a major heart attack, but it is the first randomized clinical trial in which doctors have used the newer diagnostic tool fractional flow reserve (FFR) to precisely assess secondary blockages. Compared with [patients](#) in whom doctors treated only the blockage that caused the heart attack, patients who received FFR-guided evaluation and treatment of all arteries were 65 percent less likely to experience the trial's primary endpoint, a composite of all-cause mortality, non-fatal heart attack, stroke and subsequent revascularization (such as angioplasty or bypass surgery to clear blocked arteries) at 12 months.

"Our study shows you can optimize treatment with this approach and potentially also have economic benefits by reducing the need for extra procedures," said Pieter Smits, MD, a cardiologist at Maasstad Ziekenhuis, Rotterdam, the Netherlands, and the study's lead author.

"For the patient, it's a tremendous advantage to know that you have been treated for the artery that brought you to the hospital but also that any

other issues have already been investigated and treated if needed. This way the patient won't need to be brought back to the hospital later on and again be put at risk with an invasive procedure or additional diagnostics."

The study focused on patients experiencing ST-elevated myocardial infarction (STEMI), the most serious type of heart attack. Heart attacks occur when an artery that supplies blood to the heart becomes blocked, typically due to plaque buildup that ruptures and forms a blood clot. Deprived of oxygen, portions of the heart tissue die, known as infarction. To treat STEMI, doctors typically clear the infarct-related artery with percutaneous coronary intervention (PCI), which involves threading a thin wire to the blockage and then using a tiny balloon, and sometimes also a mesh tube called a stent, to open the artery and restore blood flow.

Medical guidelines currently recommend performing PCI on the infarct-related artery after STEMI and leaving the other arteries alone, treating them later if subsequent tests or symptoms indicate they are substantially blocked by areas of plaque buildup, known as atherosclerotic lesions. Smits and his colleagues sought to investigate whether FFR could offer an opportunity to improve outcomes by refining doctors' ability to identify problematic lesions immediately after successful initial PCI. Because it is based on precise measures of blood pressure near lesions, FFR provides a much more accurate assessment of blockages than was previously possible with angiogram alone.

The researchers enrolled 885 STEMI patients at 24 sites in 12 countries in Europe and Asia. Immediately after the infarct-related artery was cleared using PCI, stable patients were randomly assigned to receive FFR-guided assessment of other arteries but no additional PCI (infarct-only revascularization, performed in 590 patients) or FFR-guided assessment and, when indicated by an FFR score of 0.80 or lower, PCI to clear additional lesions (complete revascularization, performed in 295

patients).

The primary composite endpoint occurred in 20.5 percent of patients receiving infarct-only revascularization and 7.8 percent of patients receiving FFR-guided complete revascularization, a difference that was statistically significant. When the components of the composite primary endpoint were analyzed separately, there was no significant difference in the rates of all-cause mortality, non-fatal heart attack or stroke; however, there was a significant reduction in the incidence of subsequent revascularization procedures among patients randomized to receive complete revascularization. All non-urgent revascularization procedures performed within the first 45 days after the initial PCI based on symptoms or stress tests were excluded from this analysis to avoid biasing the results in favor of complete revascularization.

When assessing the lesions other than the one responsible for the [heart attack](#), the researchers found that only about half of these lesions were constricted enough to require treatment. Together, these results suggest that treating non-infarct related lesions is beneficial and that FFR can help clinicians to precisely identify those lesions in need of treatment.

"The results show that using FFR in the acute phase of STEMI, which was never done before, is feasible and safe," Smits said. "Furthermore, FFR-guided complete revascularization allows you to fine-tune the treatment and get better outcome results."

One downside of performing complete revascularization after initial PCI is that doing so increases the complexity of the procedure. However, the results showed that procedures in the complete revascularization arm were on average just six minutes longer than the procedures in the infarct-only revascularization arm, a difference Smits said is relatively minor and likely outweighed by the increased need for subsequent revascularization among those receiving infarct-only revascularization in

the initial procedure.

One limitation is that the study struggled with slow enrollment, in part because some participating centers were only able to enroll patients during certain hours of the day or week and because the trial excluded patients who were in shock or unstable, a relatively frequent occurrence with STEMI. The study enrolled patients from 2011 through 2015.

Another limitation is that the study was not large enough to reveal statistically significant differences in all-cause mortality or subsequent heart attacks. A larger study, currently underway, is expected to shed light on these outcomes. In addition, Smits and his colleagues plan to conduct a further analysis of the cost implications of performing infarct-only revascularization versus complete revascularization after STEMI.

The trial, called COMPARE-ACUTE, was funded by two unrestricted grants from Abbott Vascular and St. Jude Medical.

This study was simultaneously published online in the *New England Journal of Medicine* at the time of presentation.

More information: Pieter C. Smits et al. Fractional Flow Reserve–Guided Multivessel Angioplasty in Myocardial Infarction, *New England Journal of Medicine* (2017). [DOI: 10.1056/NEJMoa1701067](https://doi.org/10.1056/NEJMoa1701067)

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