

LETTERS TO THE EDITOR

Very High Perforation Rate in Patients Undergoing Unsuccessful Percutaneous Coronary Interventions of Chronic Total Occlusions Could Explain Worse Outcome in These Patients and Not Chronically Occluded Artery

In the paper by Mehran et al. (1), the authors concluded that failure to open chronic total occlusion (CTO) lesions leads to a higher rate of cardiac death, total death, and coronary artery bypass surgery (CABG). The authors explain their findings on the basis of the possible deleterious effects of a persistently closed artery leading to more adverse events. However, the authors did not comment on the procedural complications, such as perforations, that could have occurred during a long, complicated CTO procedure, such as renal failure, bleeding, or peripheral vascular injury. In this registry, patients with unsuccessful CTO percutaneous coronary intervention had a high rate of procedural-related coronary perforation (7.4% vs. 1.7% in the successfully treated arm). The authors did not mention the rate of death or urgent CABG occurring among those with coronary perforation and whether this might explain the higher frequency of CABG, mortality, and myocardial infarction occurring in the unsuccessful CTO intervention cohort.

Let us compare this study to a hypothetical randomized clinical trial where any complication (including death or perforation) would be assigned to the treatment group independent of successful delivery of the treatment (i.e., an intention-to-treat analysis). Applying this rule to the current study and transferring the perforation rate of 7.5% in the unsuccessful CTO intervention arm (higher than the 5.8% cardiac mortality in the failed CTO arm after 5 years) to the arm with successful CTO intervention would clearly show that overall CTO intervention led to a relatively poor outcome. Therefore, their conclusion should have been that intervention of CTO lesions would have been harmful due to the very high procedural complication rate, offsetting any potential benefit. Multivariate analysis adjusting for perforation would be invalid, because perforation was related to intervention and not due to a permanently occluded artery that was blamed for the poor long-term outcome. Other important percutaneous coronary intervention-related complications, such as contrast-induced nephropathy and bleeding, were not mentioned. Lee et al. (2) published their experience with regard to unsuccessful CTO intervention in the same month that this current report was published. In the Lee et al. (2) paper, they showed no difference in any outcomes between successful or unsuccessful CTO intervention, despite worse baseline characteristics of patients undergoing unsuccessful CTO attempt, thereby somewhat contradicting the current paper.

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Chronic Total Occlusion Recanalization

A Call for a Randomized Trial

Mehran et al. (1) recently reported the results of a multicenter observational study examining long-term outcomes of 1,791 patients after percutaneous coronary intervention (PCI) for chronic total occlusion (CTO) lesions, comparing the patients who succeeded in the procedure with those who failed. The authors report an overall procedural success rate of 68% and detected in their model that a successful CTO procedure was an independent predictor of reduced cardiac mortality with a strong trend toward lower all-cause mortality. Although the authors should be congratulated for reporting on such a large cohort of patients undergoing PCI to CTO lesions, we found the analysis biased against the patients who failed PCI. Furthermore, there are several methodological deficiencies in the study that significantly impair the power of this study and put into question the accuracy of their conclusion.

To address the question of whether treating CTO by PCI impacts on late clinical events, the control group should have appropriately included patients assigned to medical therapy and not those who failed PCI. Comparing the treatment effect of a device between a group that succeeded in a procedure and another that failed might directly lead to a major bias and does not offer any meaningful conclusion other than the intuitive fact that when the procedure fails it is bad for the patient.

Second, the authors also reported that the rate of coronary artery bypass graft procedures for the failed PCI group was higher in patients whose occlusions could not be opened (13.3% vs. 3.2%, $p < 0.01$), leading to an impression that such an event is more frequent when the attempt to open a difficult CTO has failed;