

Letter to the Editor

## The Impact of Percutaneous Coronary Intervention on Echocardiographic Parameters in Patients with Chronic Total Occlusion of the Coronary Arteries with Diverse Left Ventricular Ejection Fractions: A Single-Center Retrospective Study

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Dear Editor,

We read with great interest the work of Zhu *et al.* [1] titled “The Impact of Percutaneous Coronary Intervention on Echocardiographic Parameters in Patients with Chronic Total Occlusion of the Coronary Arteries with Diverse Left Ventricular Ejection Fractions: A Single-Center Retrospective Study” and would like to offer the following observations, which we believe could improve the study’s comprehensiveness and clarity. The exclusion criteria described in the study are vague and lack essential details. For instance, the study does not define how recent a myocardial infarction needs to be to warrant exclusion. While patients with prior cardiac catheterization were excluded, it is counterintuitive why prior myocardial infarction would also be excluded if revascularization had not been performed. Similarly, the study does not clarify whether the reduced ejection fraction was chronic or acute, nor does it attempt to explain its etiology, which is crucial for understanding the baseline characteristics of the cohort. The exclusion of cardiogenic shock raises concerns, as this group of patients could potentially benefit from chronic total occlusion percutaneous coronary intervention and experience improvement in left ventricular ejection fraction. Its exclusion should have been explained. Valvular heart disease was also excluded, but no details were provided on the extent of disease that would lead to exclusion. In clinical practice, particularly in older populations, valvular heart disease often coexists with other cardiovascular conditions. Similarly, severe hepatic and renal impairment were excluded without a rationale, even though the association between coronary artery disease and renal impairment is well studied [2].

The study does not report segmental wall motion abnormalities from pre-procedure echocardiograms, nor does it correlate these findings with the specific blood vessels involved in the chronic total occlusion. This omission, along with the lack of data on stenting of neighboring vessels during percutaneous coronary intervention (PCI), limits the ability to assess the overall coronary artery disease burden and determine whether the improvement in left ventricular ejection fraction (LVEF) can be directly attributed to the

chronic total occlusion PCI. The small increase in mean LVEF from  $36.49 \pm 5.92$  to  $39.68 \pm 5.54$  raises further questions, as this modest change could be due to transient myocardial stunning rather than a sustained improvement. This is particularly relevant given that baseline LVEF was measured within 24 hours before PCI, a period when acute dysfunction is more likely to be observed. Additionally, 65.7% of patients in the low LVEF group presented with acute coronary syndromes, and 25.4% with myocardial infarction, suggesting that the reduced LVEF might be acute rather than chronic. Without data on prior LVEF measurements or the contribution of PCI performed on neighboring vessels, it becomes challenging to establish that the low LVEF was chronically reduced and that the chronic total occlusion PCI was the primary driver of improvement.

The study does not provide a subgroup analysis of patients undergoing elective versus emergent catheterization, nor does it discuss the time from symptom onset to intervention—both crucial factors that could significantly influence patient outcomes in this cohort. Furthermore, the six-month follow-up does not specify whether the echocardiographers assessing LVEF were blinded. If blinding was not implemented, it introduces a substantial source of bias that could undermine the validity of the results. Additionally, the study fails to report key information such as the occurrence of repeat PCI, the need for coronary artery bypass grafting (CABG), the presence or absence of residual stenosis, or compliance with medications, particularly dual antiplatelet therapy and guideline-directed medical therapy for heart failure at six months—all of which are well-established factors influencing the recovery of LVEF [3].

The post hoc analysis used in the study is reasonable, given its retrospective design; however, the research question could be more effectively addressed through a prospective study incorporating an a priori power analysis. Since previous research has shown improvements in LVEF after PCI, both with and without Chronic Total Occlusion (CTO) [3,4], employing a one-tailed approach in the post hoc analysis might have been more suitable. This method would provide greater statistical power, as there is a strong theoret-



ical basis to anticipate an effect in a specific direction. Furthermore, while the study identifies significant differences in age and body mass index (BMI) between the groups, it does not account for these potential confounders in its pre- and post-PCI comparisons, which undermines the reliability and robustness of the results.

The absence of confidence intervals for the outcomes is a notable limitation of the study. Confidence intervals provide a clearer understanding of the precision of the observed effects and their variability. This is particularly relevant given the modest improvement in LVEF reported in the study. Confidence intervals also help determine whether the observed changes are clinically meaningful. For instance, if the confidence interval for the difference in LVEF includes values indicating minimal improvement (e.g., <5%), the results may lack practical significance despite being statistically significant. Moreover, including confidence intervals would make it easier for future researchers to incorporate the findings into meta-analyses, which are essential for establishing CTO PCI as a reliable intervention to improve LVEF. In essence, confidence intervals not only enhance the interpretability of results but also bridge the gap between statistical significance and clinical relevance, providing a more comprehensive perspective on the intervention's impact.

In summary, while the study notes an improvement in LVEF in the reduced ejection fraction group after chronic total occlusion PCI, significant methodological limitations and a lack of key data raise concerns about the validity and clinical applicability of the findings. We believe addressing these issues would significantly strengthen the study and its implications.

## Author Contributions

This manuscript was completed by MQ, alone.

## Ethics Approval and Consent to Participate

Not applicable.

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## Conflict of Interest

The authors declare no conflict of interest.

## References

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