Ischemic burden reduction after chronic total occlusion percutaneous coronary intervention related to patient prognosis

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Background: Chronic total occlusion (CTO) percutaneous coronary intervention (PCI) leads to major reductions in ischemic burden. However, to date, studies investigating if more ischemia reduction after CTO PCI translates into an improved patient prognosis, are lacking.

Purpose: To evaluate if change in absolute myocardial perfusion after CTO PCI is related to patient prognosis.

Methods: Between 2013–2019, 219 prospectively recruited patients with a CTO underwent quantitative [15O]H2O positron emission tomography perfusion imaging before and 3 months after successful CTO PCI in a single high-volume CTO PCI center (175 procedures/year). Changes in perfusion defect size (in myocardial segments) and hyperemic myocardial blood flow (MBF, in mL min^{-1} g^{-1}) within the CTO territory after PCI were related to the combined endpoint of death or myocardial infarction (MI). Kaplan-Meier curves (log-rank test) and multivariable Cox regression (including covariates age, gender, prior MI, and left ventricular function) were used to analyze unadjusted and risk-adjusted event-free survivals with HR [95% CI].

Results: Out of 213 (97%) patients with a median follow-up of 3.2 [2.1–4.7] years, 22 (10%) patients experienced the composite of death (19, 9%) or MI (5, 2%). Event-free survival was significantly improved in patients with a perfusion defect size reduction of $\geq$3 segments (N=132, 62%) after CTO PCI compared to $<$3 segments (p=0.01, risk-adjusted: p=0.02 with HR 0.36 [0.15–0.87]), as well in patients with increase in hyperemic MBF above the median of the population (delta $>$1.13 mL min^{-1} g^{-1}) as compared to below the median (p$<$0.01, risk-adjusted: p=0.01 with HR 0.27 [0.10–0.75]). After PCI, patients with $\geq$1 segment residual perfusion defect size in the CTO territory at follow-up (N=114, 54%) had a significantly worse event-free survival compared to patients with no residual defect size (p$<$0.01, risk-adjusted: p=0.01 with HR 4.12 [1.35–12.59]), whereas patients with a residual hyperemic MBF $>$2.30 mL min^{-1} g^{-1} (N=105, 49%) showed a better event-free survival compared to patients with lower residual hyperemic MBF levels (p=0.02, risk-adjusted: p=0.04 with HR 0.33 [0.12–0.95]).

Conclusions: Patients with more ischemic burden reduction and less residual ischemia following CTO PCI showed a major improved survival free of death or MI. A limitation was the low absolute number of events that prohibited more extensive risk-adjustment of the analyses.