Time-dependent improvement in coronary flow reserve in collateral donor artery following successful recanalization of the Coronary Chronic Total Occlusion

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Background: Coronary chronic total occlusion (CTO) is characterized by the presence of collateral blood vessels which can provide additional blood supply to CTO-artery dependent myocardium. Successful CTO recanalization is followed by significant decrease in collateral donor artery blood flow and collateral derecruitment.

Purpose: Study aim was to assess time-dependent changes in coronary flow reserve (CFR) in collateral donor artery after CTO recanalization and identify factors that influence these changes.

Methods: Our study enrolled 31 patients with CTO scheduled for percutaneous coronary intervention (PCI). Non-invasive CFR was measured before PCI in collateral donor artery, and 24h and 6 months post-PCI in CTO and collateral donor artery. Gated SPECT MIBI was performed before PCI, while quality of life was assessed by Seattle angina questionnaire (SAQ) pre-PCI, and 6 months after PCI.

Results: Collateral donor artery showed significant increase in CFR 24h after CTO recanalization compared to pre-PCI values (2.30±0.49 vs. 2.71±0.45, p=0.005), which remained unchanged after 6 months (2.68±0.24). Maximum baseline blood flow velocity of the collateral donor artery showed significant decrease measured 24h post-PCI compared to pre-PCI values (0.28±0.06 vs. 0.24±0.04m/s), and remained similar after 6-months. There was no significant difference in maximum hyperemic blood flow velocity pre-PCI, 24h and 6 months post-PCI. CFR change of the collateral donor artery 24h post-PCI compared to pre-PCI values showed inverse correlation with left ventricle ejection fraction (LVEF) measured on SPECT. CFR changes showed no correlation with the changes in quality of life assessed by SAQ post-PCI compared to pre-PCI.

Conclusions: Significant increase in CFR of the collateral donor artery was observed within 24h after successful recanalization of CTO artery, which maintained constant after the 6 months follow-up. This increase was largely driven by the significant reduction in the maximum baseline blood flow velocity within 24h after CTO recanalization compared to pre-PCI values. Our results suggest that possible benefit of CTO recanalization could be the improvement in physiology of the collateral donor artery.