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Abstract 8: Non-invasive Coronary Physiology Based On Computational Analysis Of Intracoronary Transluminal Attenuation Gradient

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Introduction: Invasive procedure is a prerequisite for studying coronary physiology. We established the measurement of non-invasive physiological parameters including coronary blood flow (CBF), flow velocity, and microvascular resistance using coronary computed tomography angiography (CCTA).

Methods: Vessel-specific CBF was derived from transluminal attenuation flow encoding (TAFE) and then tested using three separate datasets consisted of computational simulation, human perfusion CT, and human CCTA.

Results: TAFE-derived CBF correlated well with measured vessel-specific myocardial blood flow and CBF. TAFE-derived CBF per myocardial mass consistently decreased with the progressive severity of stenosis, and it was found to better to detect significant stenosis than transluminal attenuation gradient (TAG). With the addition of vessel anatomy, TAFE-derived CBF could calculate flow velocity and microvascular resistance. The results of non-invasively acquired parameters according to the severity of stenosis were similar to those obtained through invasive physiology studies.

Conclusions: Our study demonstrated that non-invasive comprehensive coronary physiology parameters can be derived from CCTA without any pre-specified condition or performing complex heavy computational processes. Our findings are expected to expand the clinical coverage of CCTA and coronary physiology.

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