Non-invasive identification of coronary collateral vessel using coronary computed tomography angiography

Well-developed coronary collaterals are protective from myocardial ischemia, mitigates myocardial infarction, and improves survival in patients with totally occluded coronary arteries. However, systematic non-invasive description of collaterals is limited. We investigated non-invasive identification of coronary collaterals using coronary computed tomography angiography (CCTA). In this multicenter registry, we investigated collaterals supplying 1019 totally occluded arteries from 910 patients who underwent both CCTA and coronary angiography. CCTA identified collateral by continuous vascular connection between donor and recipient vessels. Angiographic well-developed collaterals were defined by Rentrop score=3 and collateral connection score=2, which respectively reflects function and size of collateral flow. In per vessel analysis, CCTA identified collaterals in 25% of totally occluded arteries with 94% specificity. Nine anatomically distinct collateral pathways were determined and were different in frequency (p<0.001). Compared to 771 total occlusions without CCTA-identified collaterals, 248 total occlusions with CCTA-identified collaterals showed higher frequency of well-developed collateral and higher transluminal attenuation gradient (p<0.001, all). The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of CCTA for angiographic well-developed collateral was 49%, 83%, 46%, 84%, and 75%. CCTA could identify presence of collaterals in 1 out of every 4 totally occluded arteries. A half of CCTA-identified collaterals was well-developed collateral. Non-invasive assessment of well-developed collaterals may be a new tool for risk stratification of patients with totally occluded coronary artery.