A man aged 56 years presented with worsening exertional angina. Coronary angiography showed a moderate-to-severe stenosis in the mid left anterior descending artery (LAD) [Figure 1a]. The right coronary artery (RCA) was chronically occluded (Figure 1b). A coronary pressure wire assessment of the mid-LAD lesion yielded a fractional flow reserve (FFR) of 0.72, indicating this to be functionally significant (Figure 2a). The patient did not wish to have cardiac surgery, and thus, a percutaneous revascularization strategy was proposed. The RCA was successfully revascularized with 2 drug-eluting stents (Figure 1e). Repeat coronary pressure assessment of the mid-LAD lesion yielded an FFR of 0.84, indicating this to be no longer functionally significant (Figure 2b). Given this result, we decided not to proceed with coronary angioplasty to the LAD. The patient was discharged without antianginal therapy and has been free of anginal symptoms at follow-up. The mechanisms for this change in FFR are discussed below.

The FFR is the ratio of the maximum myocardial blood flow in the presence of the coronary stenosis to the maximum myocardial blood flow in the absence of the coronary stenosis. It depends on an interaction among the severity of coronary stenosis, the extent of perfusion territory, and the presence of antegrade and collateral myocardial blood flow. The greater the myocardial perfusion territory distal to a coronary stenosis, the greater the functional significance placed on the stenosis. In the presence of collateral supply to the myocardium distal to a coronary occlusion, the perfusion territory of the occluded vessel becomes incorporated into that of the donor artery supplying the collateral flow. Restoration of antegrade flow in a collateral-dependant coronary artery results in a reduction in collateral flow and function. A rapid reduction in collateral function can be seen after revascularization of a collateral-dependant coronary artery.

In this case, recanalization of the RCA and restoration of antegrade flow to the RCA perfusion territory resulted in an immediate reduction in collateral function and, consequently, a reduction in the perfusion territory of the LAD. The increase in FFR reflects a reduction in the amount of
myocardium supplied by the LAD after recanalization of the RCA. The morphological severity of the LAD stenosis is unchanged, but with a reduction in the perfusion territory of the LAD, the functional severity of the stenosis decreases, accounting for the change in FFR (Figure 3). This case illustrates how a reduction in the perfusion territory of a coronary artery can alter the functional significance of a coronary stenosis. Given the repeat FFR measurement was made immediately after restoration of antegrade flow, this case also illustrates how restoration of antegrade flow can result in the immediate reduction in collateral function.

Disclosures

None.

References


Key Words: collateral circulation • chronic total occlusion • fractional flow reserve • myocardial perfusion territory
Reduction in Myocardial Perfusion Territory and its Effect on the Physiological Severity of a Coronary Stenosis
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