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Treatment of Saphenous Vein Graft Disease: "Never Ending Story" of the "Eternal Return"

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The long-term failure of the saphenous vein graft (SVG), when used for surgical coronary revascularization, is a consequence of accelerated atherosclerosis and intimal fibrosis. The incidence of SVG occlusion has been reported to be as high as 41% in the first year (1). In the majority of the cases, SVG percutaneous intervention is the treatment of choice with respect to the high risk of mortality and morbidity of the repeated surgery; in addition, it accounts for approximately 5% to 10% of the cath lab patients (2). In comparison with percutaneous coronary intervention (PCI), SVG intervention is technically challenging and associated with higher rates of periprocedural myocardial infarction (MI), in-hospital mortality, restenosis, and occlusion because of the soft atheromatous and thrombotic debris that develop when SVGs deteriorate (3). Even the rate of stent failure is significantly higher due to the progression of disease outside the stented segment; thus, PCI of native coronary artery lesions should be pursued when feasible.

A common complication of SVG intervention is the distal embolization from a typically friable plaque. This may result in the slow flow phenomenon in approximately 10% to 15% of cases and is associated with periprocedural angina and ST-segment changes (4). Although usually transient and perhaps hard to predict, the rate of periprocedural MI can be as high as 30% and the in-hospital mortality is ten-fold as high as PCI (5). Lesion length, greater angiographic degeneration of SVGs, and larger estimated plaque volume have been identified as predictors of 30-day major adverse cardiac events (MACE) after SVG intervention (6). This may be explained by the fact that the greater the amount of plaque is, the greater the likelihood of distal embolization after intervention would be, which might lead to MI. Conceivably, the success of the intervention in a chronically occluded SVG is poor; thus, it should be avoided in favor of the PCI for native coronaries (7). The concept of plaque sealing, i.e. prophylactically stenting of intermediate lesions, has been investigated with inconclusive results (8). The same is true for the ideal antithrombotic regimen during the intervention, although the use of bivalirudin in a subset of the ACUITY study seemed to offer better safety profile in comparison to IIb/IIIa inhibitors (9). On the other hand, a larger body of evidence supports the use of drug-eluting stent over bare metal stent to reduce the rate of MACE, mortality, target lesion revascularization, and target vessel revascularization without increased risk of MI or stent thrombosis (10). Of note, use of covered stent, although theoretically sound, failed to show significant advantages with respect to bare metal stent (11-13). In comparison to predilation, direct stenting has the potential benefit of decreasing embolization (14). The need for measures to reduce the rate of distal embolization has been clearly highlighted by the American College of Cardiology/American Heart Association PCI guidelines that recommend the use of embolic protection devices as Class I (level of evidence B). Nevertheless, their use remains low (15). The manuscript from Sadr-Ameli et al. actually reflects the current situation (16). They analyzed a population of 150 patients without acute coronary syndromes and with indication of PCI for a SVG occlusion. They compared those patients in which an embolic protection devices (EPD) had been used with those in which a direct stenting had been performed. Numerically, they found a considerable lower number of events in the population treated with an EPD although it was not statistically significant. Overall, they reported a 16% MACE rate in hospital, which was consistent with the previous reports (7).

Not all the embolic protection devices are created equal; they include occlusion balloon plus aspiration systems, distal filter-based devices, and proximal flow interruption catheters (17). Distal balloon occlusion of the SVG beyond the lesion creates a stagnant column of blood that can be removed by an aspiration catheter before occlusion balloon deflation and restoration of antegrade blood flow. The main advantage is the capacity of entrap-

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ping debris of all sizes and its drawbacks are inadequate protection when crossing the lesion and temporary cessation of blood flow. Of note, distal lesions are not suitable as a disease-free landing zone of approximately 3 cm distal to the lesion is required. A distal filter system is basically composed of a filter attached to a guide wire and sheathed within a delivery catheter. A retrieval catheter is provided. Advantages include the ease-of-use and maintenance of antegrade blood flow during PCI. Main drawbacks include the inability to completely entrap microparticles and inability to be used in very distal lesions because of the need for a landing zone.

The FDA-approved Proxis embolic protection system (St. Jude Medical, Maple Groves, Minnesota) uses a proximal balloon occlusion to create a column of blood. After completion, the blood containing the debris can be aspirated. The main advantage is that the protection from distal embolization starts before crossing the lesion. One disadvantage is inability to use the device in ostial or very proximal lesions as approximately 15 mm of disease-free segment proximal to the target lesion is required; another disadvantage is myocardial ischemia as a result of cessation of the antegrade perfusion. Despite using these tools, the distal embolization phenomenon can still occur and in these cases a pharmacotherapy targeted at microvascular flow with intragraft administration of vasodilators (adenosine, nitroprusside, verapamil, or nicardipine) is needed; however, convincing clinical trial data are insufficient. Delivery of pharmacotherapy to the distal microvasculature can be maximized with a microcatheter such as an aspiration thrombectomy catheter. Despite a growing body of experience and data, treatment of SVG disease is still a challenging field; however, when a degenerated SVG causes ischemic symptoms, PCI of the native coronary arteries should be considered whenever possible.

Authors' Contributions

Study concept and design: Luca Testa; acquisition of data: not applicable; analysis and interpretation of data: not applicable; drafting of the manuscript: Luca Testa; critical revision of the manuscript for important intellectual content: Luca Testa and Francesco Bedogni; statistical analysis: not applicable; administrative, technical, and material support: not applicable; study supervision: not applicable.

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