

PCI for an Occluded Saphenous Vein Graft

Treating a lesion with high thrombus burden in a saphenous vein graft using a self-expandable stent, distal protection, and thrombectomy.

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Treating acute coronary syndromes involving a saphenous vein graft (SVG) remains a challenge for interventional cardiologists. Data from the Department of Veterans Affairs Cooperative Study showed a 10-year patency rate of SVGs at 61%.¹ Due to an aging population and a substantial number of coronary artery bypass grafting (CABG) procedures worldwide, recurrent ischemia and ACS due to SVG stenosis will become a more frequent clinical problem, especially when the time from the CABG to ACS is more than 5 years.² In addition, patients undergoing percutaneous coronary intervention (PCI) of the SVG have higher procedural-risk and in-hospital mortality than patients undergoing PCI in native coronary arteries.^{3,4}

In the following case report, we hope to illustrate an example of how this difficult presentation can be successfully managed.

CASE REPORT

A 70-year-old man presented to the emergency department with chest pain at rest, which had intensified during the last 6 hours. His medical history included hypertension, hyperlipidemia, and smoking. He also had a history of coronary artery disease, which was treated with PCI in the circumflex artery in 1999. In 2001, the patient underwent CABG with three grafts (left internal mammary to the left anterior descending artery, an SVG to the circumflex artery, and an SVG to the posterior descending artery). After that, he had PCI in his SVG to the obtuse marginal artery, with implantation of a bare-metal stent (2013).

His current medications included 75 mg of aspirin, 75 mg of clopidogrel, 5 mg of bisoprolol, 5 mg of ramipril, 40 mg of atorvastatin, and 20 mg of a proton pump inhibitor. The physical examination revealed tachycardia of 100 bpm and increased arterial blood pressure

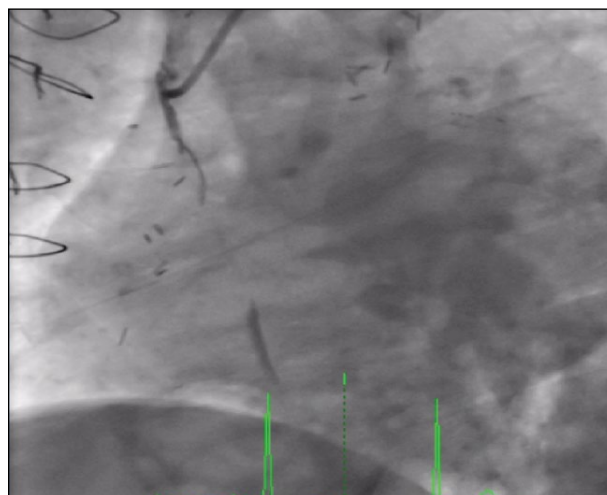


Figure 1. Thrombotic occlusion of the SVG to the RCA.

of 160/100 mm Hg. Electrocardiography showed sinus tachycardia; negative T-waves in leads II, III, and aVF; and 2-mm ST-segment depressions in leads V4 through V6. Transthoracic echocardiography demonstrated hypokinesia of the inferior wall, a preserved left ventricular ejection fraction of 58%, and no valvular disease.

On admission, the biochemistry findings showed a normal level of troponin T (0.006 ng/mL) and preserved renal function (estimated glomerular filtration rate, 78 mL/min/1.73 m²); however, 2 hours later, there was an increase of troponin T (0.213 ng/mL). His GRACE risk score was 224 points, which classified him as high risk. Despite administration of intravenous nitrates and analgesics and normalization of blood pressure, the chest pain persisted, and the patient was transferred to the cath lab.

Coronary angiography revealed a thrombotic occlusion of the SVG to the right coronary artery (RCA) with a TIMI flow of 0 (Figure 1), normal flow in the other



Figure 2. Deployment of the self-expanding stent (Stentys).

grafts, and chronic total occlusion of the native RCA. The strategy was to perform PCI of the culprit lesion in the SVG to RCA while minimizing the risk of distal embolization associated with the high thrombus burden by using manual thrombectomy, glycoprotein IIb/IIIa inhibitor, and a distal protection device.

After an intracoronary bolus of eptifibatide (180 µg/kg), intravenous infusion was started (2 µg/kg/min for 18 hours), and a guidewire (BMW, Abbott Vascular, Santa Clara, CA) was passed through the lesion; however, flow was not reestablished. After predilation with a small balloon (2- X 20-mm Sprinter, Medtronic, Inc., Minneapolis, MN), a distal protection device (4-mm SpiderFX, Covidien, Mansfield, MA) was inserted. Manual thrombectomy (Export catheter, Medtronic, Inc.) was then performed, and thrombus fragments were successfully removed.

We decided to treat the culprit lesion with a 3- to 3.5-mm X 27-mm self-expandable Stentys stent (Stentys, Princeton, NJ). After implantation, the stent was postdilated with a 3.5- X 20-mm Sprinter balloon (Figure 2). The proximal part of the SVG was treated with a 3.5- X 28-mm bare-metal stent (MultiLink Vision, Abbott Vascular). The distal protection device was removed, and inspection of the filter showed thrombotic debris.

After the intervention, the patient was stable, without any chest pain, his heart rate was 80 bpm, and his arterial blood pressure was 140/100 mm Hg. During 1-month follow-up, we performed follow-up angiography, which showed complete resolution of thrombus, without significant residual stenosis in either of the stents (Figure 3). Echocardiography showed a normal ventricular function (60%), without any wall motion abnormality, and the patient remained asymptomatic.

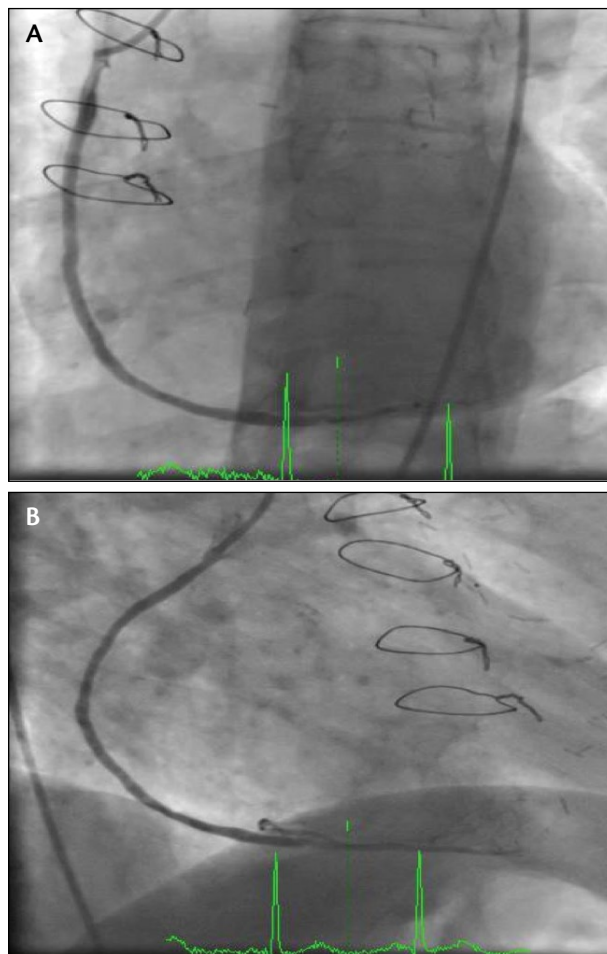


Figure 3. Final angiographic results immediately postprocedure (A) and at 1-month follow-up (B).

DISCUSSION

The rationale for using the self-expandable Stentys stent is to avoid distal embolization and to optimize the apposition of the stent to the vessel wall. The former is facilitated by the reduced stent cell area (0.95 mm²), which increases the containment of the thrombus between struts and the vessel wall. The latter uses the self-expansion properties of the stent over time, which prevents undersizing of the stent in the recently reopened vessel. The implantation is slightly different than for metallic stents. Stentys is covered with a retractable sheath and has three markers: proximal, distal, and outer sheath. When implanting this device, the outer sheath marker should be located at least 5 mm distally to the lesion in order to achieve full coverage.

Strategy for Treating an Infarct-Related Artery in an SVG

SVG atheroma, compared with atheroma in native coronary arteries, is usually more lipid-rich, diffuse, concentric,

softer, and more prone to rupture, which increases the risk of distal embolization during PCI.⁵ Such procedures are at higher risk of distal embolization and inferior results during long-term follow-up due to a higher incidence of in-stent restenosis.^{6,7} It has been suggested that distal embolization was observed in as many as 15% of cases.⁸ Therefore, the use of distal embolic protection devices, according to American Heart Association/American College of Cardiology guidelines (class I), is clearly beneficial. Although data on the benefits of manual thrombectomy are limited to ST-segment elevation myocardial infarction (STEMI), it seems that for such lesions with large thrombus burden, as in this case, it is also reasonable to use this technique. Not only thrombi were removed by aspiration, but we also observed some thrombotic material retrieved from the distal protection filter.

CONCLUSION

The Stentys self-apposing stent was evaluated in STEMI patients. Results from the APPOSITION III clinical trial show low rates for major adverse cardiac and cerebrovascular events (9.3%) and death (2%) at 1-year follow-up in STEMI patients.^{9,10} This stent's advantages are adaptation to vessel size, vessel tapering, stent sizing and good apposition. There is no trial designed to specifically assess this device in SVGs; however, we believe

that primary PCI in bypass grafts might be considered as one of the indications for this device. ■

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1. Goldman S, Zadina K, Moritz T, et al. Long-term patency of saphenous vein and left internal mammary artery grafts after coronary artery bypass surgery: results from a Department of Veterans Affairs Cooperative Study. *J Am Coll Cardiol.* 2004;44:2149-2156.
2. Chen L, Theroux P, Lesperance J, et al. Angiographic features of vein grafts versus ungrafted coronary arteries in patients with unstable angina and previous bypass surgery. *J Am Coll Cardiol.* 1996;28:1493-1499.
3. Boatman DM, Saeed B, Varghese I, et al. Prior coronary artery bypass graft surgery patients undergoing diagnostic coronary angiography have multiple uncontrolled coronary artery disease risk factors and high risk for cardiovascular events. *Heart Vessels.* 2009;24:241-246.
4. Brilakis ES, Rao SV, Banerjee S, et al. Percutaneous coronary intervention in native arteries versus bypass grafts in prior coronary artery bypass grafting patients: a report from the National Cardiovascular Data Registry. *JACC Cardiovasc Interv.* 2011;4:844-850.
5. Webb JG, Carere RG, Virmani R, et al. Retrieval and analysis of particulate debris after saphenous vein graft intervention. *J Am Coll Cardiol.* 1999;34:468-475.
6. Banerjee S, Brilakis ES. Embolic protection during saphenous vein graft interventions. *J Invas Cardiol.* 2009;21:415-417.
7. Brilakis ES, Saeed B, Banerjee S. Drug-eluting stents in saphenous vein graft interventions: a systematic review. *EuroIntervention.* 2010;5:722-730.
8. Henriques JP, Zijlstra F, Ottenvanger JP, et al. Incidence and clinical significance of distal embolization during primary angioplasty for acute myocardial infarction. *Eur Heart J.* 2002;23:1112-1117.
9. Ramcharitar S, Verheyen S. The Stentys self-apposing stent in bifurcation lesions. *EuroIntervention.* 2010;6(suppl J):1151-1154.
10. Amoroso G. APPOSITION III. Presented at EuroPCR 2013; May 21-24, 2013; Paris, France.