Drug-Eluting Stents Versus Bare Metal Stents in Saphenous Vein Graft Intervention

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KEYWORDS

• Drug-eluting stent • Bare metal stent • Saphenous vein graft • Percutaneous intervention

KEY POINTS

- Percutaneous coronary intervention (PCI) of saphenous vein graft (SVG) is technically challenging because of complex plaque morphology and has been associated with higher adverse event rates, lower procedural success, and inferior long-term patency rates compared with native vessel PCI.
- A patient's ability to comply with dual antiplatelet therapy and whether the patient will need an interruption in dual antiplatelet therapy should be taken into account when deciding whether to implant a drug-eluting stent (DES) or bare metal stent (BMS) in a SVG.
- DES use in SVG reduces target vessel revascularization (TVR) across observational and randomized studies. Meta-analyses provide evidence that DES use in SVGs reduces the composite of major adverse events driven mainly by TVR reduction, but DES do not conclusively reduce rates of future death and MI.
- It is the author's opinion that in the absence of contraindication, DES should be used for SVG PCI, because they appear to reduce TVR without increasing rates of adverse events. However, DES use for SVG lesions remains an off-label indication.

INTRODUCTION

Coronary artery bypass graft (CABG) surgery remains one of the main treatments for coronary artery disease (CAD). Use of the reversed saphenous vein graft (SVG) as conduit for CABG was popularized by Favaloro[1] in 1969 and remains essential in the contemporary surgical treatment of CAD. Percutaneous coronary intervention (PCI) in SVG can be technically challenging because of the presence of complex friable plaque and thrombus, which may embolize and cause distal stasis and periprocedural myocardial infarction (MI).[2] SVG PCI has been associated with higher adverse event rates, lower procedural success, and inferior long-term patency rates compared with native vessel PCI.[3–8] Drug-eluting stents (DES) have been shown to reduce target vessel revascularization (TVR) in native coronary arteries; however, SVG PCI remains an off-label indication for DES use.[9,10] According to a study that analyzed the National Cardiovascular Data Registry from January 1, 2004 to March 31, 2009, SVG PCI represented 5.7% of total PCI volume and DES

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were used in 64.5% of cases.[11] This article reviews the evolution and contemporary evidence regarding use of DES versus bare metal stent (BMS) in SVG PCI.

PATHOPHYSIOLOGY AND PATENCY RATES OF SVGS

A combination of physical, cellular, and humoral factors predispose the SVG toward intimal hyperplasia, smooth muscle proliferation, endothelial dysfunction, deposition of extracellular matrix, and accelerated atherosclerosis, which lead to inferior patency rates compared with arterial conduits.[12] SVG lesions may present with recurrent angina related to progressive stenosis or less commonly as an acute coronary syndrome (ACS) related to acute plaque rupture that is similar to native vessel plaque rupture.[13] A study analyzing culprit SVG lesions in an ACS setting by angiography and optical coherence tomography found a fibrofatty composition in 100% of lesions, calcification in 32%, plaque rupture in 60%, and thrombus in 46% of lesions, which suggests that the mechanism of ACS in SVG is similar to that found in native vessel ACS.[14,15]

Acute SVG closure has been attributed to thrombosis or surgical technical problems. Risk factors believed to confer an increased risk of SVG thrombosis within the first 6 months of CABG surgery include aspirin nonresponsiveness, small target vessel diameter, female gender, and low graft blood flow.[16,17] Although 1-year SVG patency graft rates have been reported as low as 58% at year 1,[18] most trials report 1-year patency rates from 64% to 81%.[16,19–22] Chronic patency rates vary approximately from 69% to 86%, 60%, and 32% to 50% at 5, 10, and 15 years, respectively.[19,20,23] In comparison, left internal mammary artery (LIMA) (n = 1482) patency rates are approximately 97%, 95%, and 93% at 5, 10, and 15 years.[23]

PCI VERSUS REPEAT CABG IN OBSTRUCTIVE SVG DISEASE

Therapeutic options for obstructive SVG disease include PCI of the SVG or native vessel versus repeat CABG versus medical therapy alone. The clinical presentation, angiographic findings, amount of myocardium jeopardized by ischemia, and chances for therapeutic success should guide decision making in accordance with the 2011 American College of Cardiology Foundation (ACCF)/American Heart Association (AHA)/Society for Cardiovascular Angiography and Interventions (SCAI) PCI and ACCF/AHA CABG guidelines.[24,25] Myocardial ischemia occurring in the setting of ACS may be life-threatening, and therefore an invasive assessment with revascularization procedure should be strongly considered.[24,26] Consideration for coronary angiography should also be given to patients with previous CABG presenting with new stable angina as well to detect lesions that may be amendable to PCI before total loss of the graft.

If the decision is made to proceed to PCI, stent choice is important (DES vs BMS). Stent thrombosis can lead to considerable morbidity and mortality.[27] Therefore, the patient's ability to comply with dual antiplatelet therapy and whether the patient will need an interruption in dual antiplatelet therapy should be taken into account when deciding whether to implant a DES or BMS in an SVG.

Redo CABG has been associated with good long-term survival in appropriate candidates, with cumulative survival rates as high as 90.1%, 74%, and 63.4% at 5-year, 10-year, and 15-year follow-ups, respectively.[28] However, redo CABG is associated with increased operative mortality and morbidity and carries approximately 2.5 to 3.5 times higher risk of postoperative mortality compared with primary CABG.[29,30] A contemporary report analyzed outcomes of 458 patients who underwent repeat CABG from 2001 to 2008 and found that operative mortality was 4.8% for repeat CABG versus 1.8% for primary CABG ($P<.001$), and repeat CABG carried a 2.8 times higher risk for postoperative MI.[30] Repeat CABG can be technically challenging, with lack of suitable conduit or identifying targets for grafting, longer perfusion and aortic cross-clamp times, increased risk of damaging existing grafts that are patent, redo sternotomy complications, prolonged mechanical ventilator/balloon pump support, and hemorrhagic complications.[29,31,32] Furthermore, many of the patients who present with high-grade SVG stenosis are poor repeat CABG candidates because of advanced age, multiple medical comorbidities, and limited amount of myocardium in jeopardy, which often makes PCI the rational therapeutic procedure.

Summary

- In general, PCI is favored over repeat CABG if there are acceptable PCI target lesions, a patent graft to the left anterior descending (LAD), limited ischemic territory, poor graft targets, or unfavorably high surgical risk because of comorbid conditions.
- In general, factors favoring repeat CABG include availability of LIMA and other graft