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## Case report

# A case of dynamic segmental saphenous vein graft compression during diastole



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## ABSTRACT

We present the case of a patient, in whom coronary angiography performed for non-ST-segment elevation myocardial infarction five months after coronary artery bypass graft surgery disclosed a tight stenosis with superimposed diastolic compression in the proximal segment of a saphenous vein graft (SVG) to a diagonal artery. Furthermore, the SVG segment immediately distal to the stenosis exhibited obstructive dynamic compression during diastole. Stent implantation across the proximal stenosis was undertaken successfully with a consequent resolution of the dynamic downstream stenosis. This is the third case of diastolic segmental SVG compression not related to pericardial constriction ever reported in the English literature and the first case where implantation of a balloon-expandable stent was performed in an SVG to treat a significant organic stenosis with superimposed diastolic compression. We discuss the pathophysiologic characteristics of this case and the potential clinical utility of the current stent platforms to adequately scaffold such dynamic lesions.

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## Introduction

Saphenous vein grafts (SVGs) are the most frequently used conduits for coronary artery bypass graft (CABG) surgery, yet their utility is limited by gradual attrition leading to recurrent angina in 25% of CABG patients at 1 year [1]. Failure of SVGs during the first postoperative month is due to thrombotic occlusion, while later SVGs are affected by intimal hyperplasia, a process that unless being extensive does not cause significant stenosis [2,3]. Intimal hyperplasia with superimposed thrombosis is the main mechanism of SVG failure between the first month and the first year after CABG, while

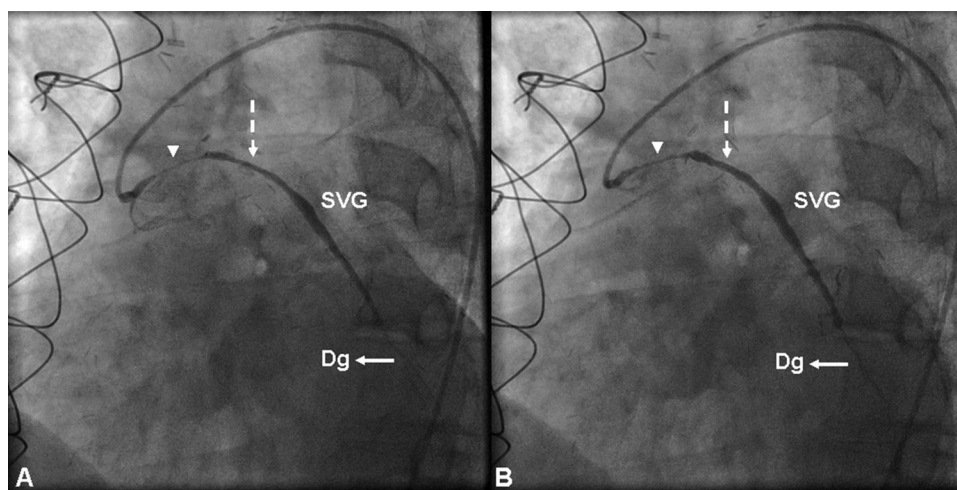
the main cause of SVG failure beyond the first postoperative year is atherosclerotic obstruction occurring on a foundation of neointimal hyperplasia. Aside from these intraluminal causes of SVG obstruction, extraluminal causes are also possible but have rarely been reported. To the best of our knowledge, fixed compression of an SVG has been described only once previously; it was due to a large pericardial hematoma formed in the immediate post-CABG period and resulted in transmural ischemia in the territory of the grafted left anterior descending (LAD) artery [4]. Dynamic segmental SVG compression has been reported in only four cases thus far [5–8]. One case involved systolic compression of an SVG to the right posterior descending artery from a dilated right atrium

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**Fig. 1 – Saphenous vein graft angiograms. Left anterior oblique angiographic views of the saphenous vein graft (SVG) to a diagonal artery (Dg) during diastole (A) and systole (B). Note the diastolic lumen compromise of the proximal tightly stenosed segment (arrowhead) and the immediately downstream mildly atheromatous segment (dashed arrow).**

causing angina, whereas the remaining three cases involved dynamic SVG compression during diastole. Herein, a unique case of diastolic segmental SVG compression not related to constrictive pericarditis is presented.

### Case report

A 46-year-old male patient was referred for coronary angiography because of non-ST-segment elevation myocardial infarction. He had a history of arterial hypertension, hyperlipidemia, cigarette smoking and coronary artery disease status postquadraple CABG with a left internal mammary artery (LIMA) graft to the LAD artery and SVGs to the first diagonal (Dg), second obtuse marginal (OM) and right posterior descending arteries five months prior to his admission. Admission electrocardiography showed dynamic ST-segment depression in leads I, aVL and V4 through V6, whereas echocardiography revealed a normal-sized left ventricle (LV) with lateral wall hypokinesia and an ejection fraction of 45%. Coronary and graft angiography showed a subocclusive left main coronary artery stenosis, a patent LIMA with good distal runoff into the mid LAD artery and retrograde flow into the proximal LAD artery and the LCx artery, occlusion of the SVG to a second OM branch and a patent SVG to the posterior descending branch of a proximally occluded right coronary artery. The SVG to the first Dg artery contained a tight proximal stenosis and non-obstructive atheromatosis in the immediately downstream segment; interestingly, these two SVG segments exhibited dynamic compression during diastole with complete obliteration of the lumen proximally and obstructive narrowing of the immediately downstream segment (Fig. 1 and Video 1). We proceeded with stent angioplasty of the proximal SVG lesion. After low pressure predilation with 1.5 mm and 2.0 mm diameter semi-compliant balloons, a 3.0 mm × 24 mm MGuard stent (MGuard™ Coronary Stent System; Inspire-MD Ltd., Tel-Aviv, Israel) was deployed across

the lesion with full stent coverage of the SVG ostium at 10 atm. Stent postdilation and “flaring” were performed with a 3.0 mm × 18 mm non-compliant balloon inflated up to 18 atm. No-reflow phenomenon was not observed and final angiography showed good dilation and patency of the SVG with normal distal runoff into the Dg artery and retrograde flow distribution to a large area of the anterior-lateral wall. Interestingly, the diastolic narrowing of the segment distal to the stented lesion was no longer present (Video 2). Postprocedural creatine kinase and creatine kinase-myocardial band isoenzyme levels were normal and the patient was discharged home the next day on dual antiplatelet therapy with aspirin and clopidogrel, an angiotensin-converting enzyme inhibitor, a beta-blocker, and a statin. The patient remained stable for 1-year post-stenting with Canadian angina class I and no evidence of a cardiovascular event.

### Discussion

Dynamic segmental compression of SVG during diastole is a rare, yet clinically relevant angiographic finding and thus far, only three cases have been reported in the English literature [6–8]. All reported cases involved diastolic segmental compression of the mid or distal shaft of a SVG to the right coronary artery in a setting of severe LV systolic dysfunction (two cases) or constrictive pericarditis (one case). The phasically compressed SVG segment was presumed to be affected by adhesions to the chest wall or nearby structures or the pericardium and diastolic compression was thought to result from cardiac dilation against the resistance offered by the adhesions. Herein, the proximal segment of the SVG to a Dg artery showed a tight stenosis with superimposed dynamic compression during diastole that is a previously unreported angiographic finding. The segment immediately distal to that lesion showed only mild atheroma and an obstructive dynamic stenosis due to diastolic compression. Intimal

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