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Case report

Successful angioplasty of saphenous venous graft in-stent restenosis using rotational atherectomy

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SUMMARY

An 81-year-old, functionally independent woman with a history of bypass surgery and a previous vein graft intervention presented to us with significant angina refractory to medical management. An urgent angiogram revealed severe in-stent restenosis (ISR) in the proximal stent of the right coronary artery graft. At the same time, multiple trials to predilate the tight ISR using various-sized non-compliant and cutting balloons were unsuccessful. During the second attempt the next day, rotational atherectomy was used for plaque modification as the lesion appeared fibrocalcific angiographically. A good imaging result was obtained after final dilatation with a drug-eluting balloon, and the patient also achieved immediate angina relief. Even though rotational atherectomy is contraindicated in vein graft interventions, it can be successfully used in selected cases when routine angioplasty techniques fail.

BACKGROUND

Rotational atherectomy is currently contraindicated in saphenous venous graft (SVG) lesions by the manufacturer (Boston Scientific, Marlborough, MA, USA) based on initially published studies for the fear of complications like distal no-reflow and coronary perforations.¹ Old venous conduits have widespread intimal hyperplasia and accelerated atherosclerosis producing characteristic SVG lesions that are diffuse, concentric, friable, with thin fibrous caps and minimal calcification.² Besides, the vessel walls become degenerate, non-compliant (NC) and lack sufficient strength when compared with native arteries. As a result, rotational atherectomy in routine vein graft lesions carries a very high risk of complications like development of no-reflow and vessel perforation. However, in-stent restenosis (ISR) in a vein graft has a different plaque composition than non-intervened vessels and sometimes they tend to be focal, non-friable and fibrocalcific.³ Only a few case reports and case series about the successful use of rotational atherectomy in vein graft lesions mostly at the ostial, anastomotic or ISR sites were described in prior literature.⁴⁻⁶ Our case had similar features of previously published reports, but it was different in the sense that rotablation of a combination of ISR and a clarified near-ostial vein graft lesion was not reported before.

CASE PRESENTATION

Our patient was an 81-year-old, functionally independent woman who presented to us with

non-ST-elevation myocardial infarction (NSTEMI) in February 2018. Her past cardiac history includes coronary bypass surgery in 1986 with two grafts (left internal mammary artery (LIMA) graft to the left anterior descending artery (LAD) and SVG to the posterior descending artery (PDA)). She had a percutaneous coronary intervention (PCI) to the native left main and left circumflex artery with a single drug-eluting stent (DES) in 2003 following an NSTEMI presentation. Subsequently, she had another NSTEMI in August 2016 and underwent a major interventional procedure on venous graft to the PDA with three DESs. Other medical history includes direct Coombs-positive autoimmune haemolytic anaemia with lymphadenopathy, essential thrombocytosis (well controlled on hydroxyurea) and monoclonal gammopathy of unknown significance.

INVESTIGATIONS

She was admitted into our coronary care unit and commenced on standard acute coronary syndrome treatment with heparin, dual antiplatelets, intravenous nitrate infusions, oral beta-blockers and also nicorandil. However, she experienced refractory angina on medical management, associated with widespread ST-segment depressions in the inferolateral leads on ECG and significant troponin elevations on blood tests (0.94 mcg/L, normal <0.04 mcg/L).

An urgent angiogram showed occluded native LAD and right coronary artery (RCA), widely patent LIMA graft, mild disease in the circumflex artery and a high-grade ISR of the proximal stent (4×23; mm Xience, Abbot Vascular, Illinois, USA) in the vein graft to the PDA.

TREATMENT

Initial attempt to predilate with multiple balloons (2.5×15.0 mm; NC Emerge, Boston Scientific, Marlborough, MA, USA) (3×12 mm, 3.5×8.0 mm; NC Emerge, Boston Scientific) at high pressures and also cutting balloons (3.5×10.0 mm and 4×10 mm; Flextone, Boston Scientific) were unsuccessful, and the procedure was abandoned (figure 1). However, she continued to have angina along with impressive ischaemic changes on the ECG. Various alternative strategies were considered like repeat angioplasty attempt by using ultrahigh-pressure OPN NC balloons, angioplasty to native RCA chronic total occlusion versus repeat bypass surgery. The ISR appeared focal, non-thrombotic and calcified



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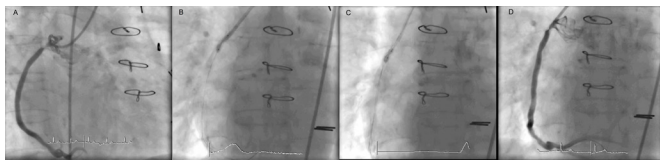


Figure 1 (A) Initial angiogram showing severe in-stent restenosis. (B) Predilatation attempt at high pressures with non-compliant balloons. (C) Predilatation attempts with a ‘buddy wire support’ and cutting balloons. (D) Significant persistent waist after the first attempt.

angiographically; hence, we opted for rotablation during our second attempt the next day. Vascular access was obtained from the right femoral artery and a 7F Multipurpose 1.0 guide catheter (Mach 1, Boston Scientific) was used to cannulate the culprit graft vessel. A Boston Scientific Floppy Rotawire was advanced across the tight stenotic lesion, and plaque modification was achieved by several runs of initially 1.5 mm and later 1.75 mm Boston Scientific rotational atherectomy burrs. As the lesion was near the ostium we had minimal guide catheter support during burr advancements and required constant forward thrust but at the same time we took extreme precautions not to go deep into the grafted vessel to minimise the risk of vessel perforation. This paved the way for subsequent predilatation with a 4×8 mm NC Emerge balloon (figure 2). Finally, plain old balloon angioplasty was done with a 3.5×30.0 mm Sequent Please (B Braun Melsungen, Germany) drug-eluting balloon (DEB), and she achieved immediate symptomatic relief.

OUTCOME AND FOLLOW-UP

Check angiogram demonstrated a good result with mild residual ISR, and the intravascular ultrasound (IVUS) imaging confirmed a minimal luminal area of 5.6 mm² with 270° calcific stenosis (figure 3). She remained angina-free after 3 months of follow-up on dual antiplatelet therapy and other standard ischaemic heart disease medications. Our case was particularly challenging as, in addition to having a severe ISR of a vein graft, it was fibrocalcific and very close to the ostium.

DISCUSSION

Currently available evidence of the use of rotational atherectomy in SVG lesions is limited to small case series and a few case reports mostly confined to the ostial and distal anastomotic sites.^{7,8} These lesions tend to be fibrotic and therefore not suitable for direct angioplasty with balloons or stents. Also, successful angioplasty of the midshaft saphenous graft stenosis with rotational atherectomy has been rarely reported.⁸ At present, other debulking options like directional coronary atherectomy and excimer laser devices are seldom used. The cutting balloon approach may not succeed as demonstrated in our case. The role of intracoronary lithotripsy appears to be promising in calcified

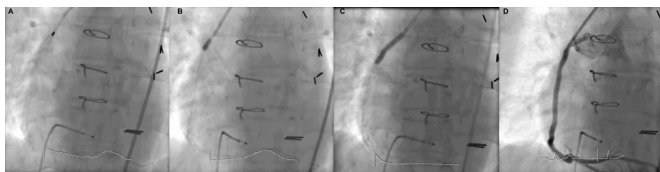


Figure 2 (A) Rotational atherectomy with a 1.75 mm burr. (B) Successful predilatation with a 4×8 mm NC balloon at high pressures. (C) Plain old balloon angioplasty with a drug-eluting balloon. (D) Final angiographical result.

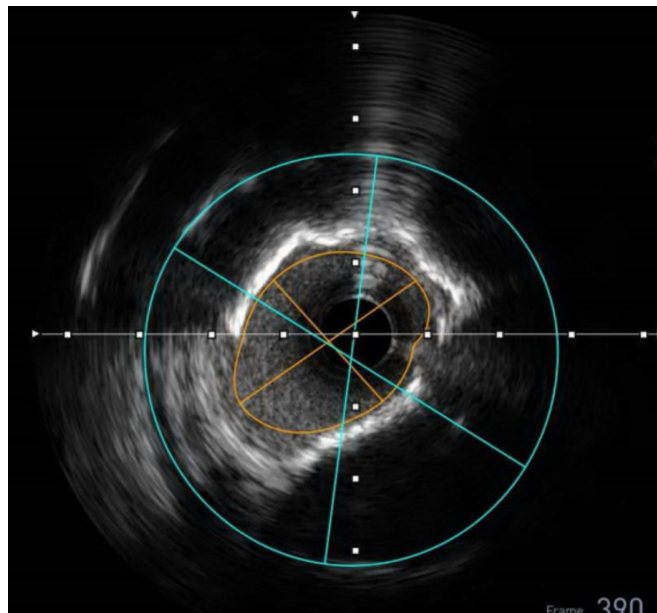


Figure 3 Postangioplasty intravascular ultrasound images.

lesions, but further evidence is awaited from ongoing clinical trials.⁹

Thomas *et al* reported the safe and effective use of rotational atherectomy to facilitate PCI and stenting in 14 patients with SVG stenoses.¹⁰ His series focused on the treatment of anastomotic sites (aorto-ostial and distal), and restenotic or fibrotic lesions rather than calcified non-dilatable stenosis in the body of the grafted vessel. The use of rotational atherectomy in calcified SVG lesions, when performed carefully by experienced operators, gives excellent results superior to other debulking strategies like cutting balloons and allows for stent placement.¹¹ The IVUS study was not done before angioplasty as the lesion was too tight, and it would have been very difficult to advance the IVUS catheter without adequate predilatations.

Rotational atherectomy is a safe and feasible option for the treatment of ISR lesions and is associated with a relatively low rate of recurrence when compared with balloon angioplasty alone.¹² A meta-analysis of angioplasty in ISR lesions concluded

Patient’s perspective

I consider myself very fortunate and lucky for being able to have this conversation with you in the first place as I have not seen many surviving so long after bypass surgery and other medical problems which I am diagnosed with. Besides you guys, I have faith in a Higher Power and know that my time has not yet come. I pray every day without fail and that gives me enough strength to face anything. I was quite anxious and worried when my first procedure failed and was having continuous chest pain in the coronary care unit. I did not lose hope even when I was asked to sign the high-risk consent form with the possibility of death on the table. What I experienced during the second procedure when the diamond burr was being drilled in my heart, especially the noises, was very awful and I did not like it at all. I felt severe tightness in my chest, and I never want to undergo that again in my life, but I am very thankful that I can live my life independently now. All the cardiology team members, doctors and nurses have done a wonderful job and looked after me well.

Learning points

- ▶ SVG lesions are usually diffuse and friable and associated with thrombus, and hence rotational atherectomy is contraindicated.
- ▶ Sometimes, the lesions are discrete and fibrocalcific as in our case, and rotational atherectomy can be considered when they are non-dilatable by routine angioplasty techniques.
- ▶ Plaque modification by rotational atherectomy is an effective alternative in all resilient ISR lesions.

that angiographical results with DEBs were better when compared with non-drug-coated balloon angioplasty or DES, but there was no statistically significant reduction in mortality rates.¹³ We employed both the strategies (rotational atherectomy and DEB) in our case to achieve a good angiographical final result and immediate angina relief to the patient.

Contributors UPP and SB were involved in planning, performing and follow-up of the procedures in the case study. UPP prepared the manuscript and SB edited the final version.

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