PCI Strategy in a Patient with Multi Venous Grafts Failure after Second CABG and Multi-Vessel CTOs: a Case Report

Miha Mrak
Clinical Department for Cardiology, University Medical Center Ljubljana
Zaloška c. 007, 1000 Ljubljana, Slovenia

Matjaž Bunc
Clinical Department for Cardiology, University Medical Center Ljubljana
Zaloška c. 007, 1000 Ljubljana, Slovenia

Correspondence to: Matjaž Bunc, MD PhD
Professor of internal medicine and pathophysiology
University Medical Center Ljubljana
Zaloška c. 007, 1000 Ljubljana
Slovenia, EU

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Abstract

Long-term patency of saphenous vein grafts remains low. Recurrent ischemia after late graft failure can be treated by re-operation or percutaneous coronary intervention (PCI). The intervention can be performed in the native artery or the bridging vein graft. We report a case of 62-year-old patient, who presented with a recurrent ischemic heart disease despite many revascularization attempts. In 1991, CABG with three saphenous vein grafts (SVGs) was performed after STEMI of the inferior wall. Due to unstable angina and occlusion of all SVGs, a second CABG with two SVGs was performed in 2005. In 2009, SVG anastomosis to OM2 was stented with DES due to NSTEMI. Later he experienced some episodes of exertional angina pectoris. Coronary angiograms revealed occlusions of RCA
and OM2 SVGs. We decided for a two staged PCI with stenting of SVG to OM2 and of CTO in the native RCA. SVG was again occluded 3 years after stenting. We successfully performed PCI of LCX CTO. Decision about revascularization must consider possible risks of both surgical and percutaneous revascularization procedures. Guidelines prefer percutaneous treatment to re-operation, and PCI in the native artery to that in a vein graft. Our experience shows that management remains complex and that long-term results remain unsatisfying.

**Keywords:** percutaneous coronary intervention, CABG, revascularization, vein graft, chronic total occlusion

1. **Introduction**

Symptomatic ischemic heart disease (IHD), resistant to medical treatment, could be treated by revascularization; either coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI). Patency of saphenous vein grafts (SVGs) 10 years after the surgical procedure remains relatively low (55-60%) and many patients thus experience a recurrent episode of IHD and revascularization episodes [1].

Failure of SVG is usually symptomatic and most of the patients need additional revascularization procedure, either be re-operation or PCI [2]. PCI re-revascularization procedures represent 10-15% of all coronary interventions [3]. PCI is mostly performed in the native artery, which remains a safer choice with a better long-term result [4, 5, 6]. However, the coronary disease in these patients is complex and the lesion of the native artery often unfavorable. In this case, intervention in SVG represents a reasonable alternative.

2. **Case report**

62-year-old patient has been treated for hypertension and mixed hyperlipidemia. He had been smoking a pack of cigarettes per day for more than 30 years, giving it up five years ago. Because of the cluster headaches, he occasionally receives a therapy with methylprednisolone.

In 1991, he suffered a ST elevation myocardial infarction (STEMI) of the posterior and inferior walls, which was treated with fibrinolytic treatment. In 1996, he underwent CABG with SVG placed to the distal RCA, distal LCX and OM2. In 2004, he underwent PCI with one stent implanted in LCX OM2.

In 2005, he was hospitalized because of a non-ST elevation myocardial infarction (NSTEMI). Echocardiology revealed concentric hypertrophy of the left ventricle and a preserved systolic function without any regional contractile dysfunction. Coronary angiogram showed the chronic total occlusions (CTO) of the proximal RCA and LCX after OM1 and complete occlusions of all three venous grafts. We decided for re-operation and the patient received another two SVGs to RCA and OM2.
In 2009, the patient experienced an unstable angina pectoris. Ventriculography showed hypokinesia of the inferior wall, but otherwise preserved systolic function (LVEF 55%). Coronary angiogram revealed CTOs of both SVGs to RCA with PDA still well perfused through extensive collaterals form LAD. The second SVG to OM2 remained patent, but with subtotal (95%) narrowing of OM2 at its distal anastomosis. We performed PCI of the SVG-OM2 anastomosis and stented by drug eluting stent (DES).

In February 2011, he was once more hospitalized for unstable angina. We performed cycle ergometry, which was positive at the load of 80W. In addition to the already known occlusions of both RCA SVGs, we discovered the occlusion of the second SVG to OM2 (Figure 1). We decided for PCI of the occluded graft and implanted three bare metal stents (BMS) back of the previously implanted stent at the anastomosis with OM2 (Figure 2). At the proximal ostium of the graft, we placed an additional DES stent. After stenting, we established TIMI-3 flow. We prescribed clopidogrel for 12 months and a continuation of the aspirin therapy. We also decided to perform myocardial scintigraphy to evaluate the significance of the CTO RCA. In June 2011, we decided for PCI of CTO RCA. We successfully treated the occlusion by using a combined PCI CTO approach of anterograde and retrograde techniques (CART, Reverse CART, knuckle,...) (Figure 3B). We had to perform rotational atherectomy at the site of occluded graft anastomosis due to tide fibrotic stenosis (Figure 3C, 3D). We implanted three DES stents. (Figure 3)

Due to exertional angina the patient was readmitted in March 2012. Coronary angiography showed hemodynamically significant stenosis at both ends of SVG to OM2. We performed PCI of the proximal lesion and implanted one DES stent and DEB-POBA of distal VG stenosis. We planned a therapy with ticagrelor 90 mg twice a day and a lifelong therapy with aspirin.

After discharge, he remained asymptomatic until the beginning of September 2013, when he started to experience stable angina. The coronary angiogram revealed a diffuse restenosis in the previously stented area of RCA (FFR 0.86) and the already known significant restenosis in the distal part of SVG to OM2. We decided for PCI of the distal part of SVG to OM2. After successful wire crossing, we did not manage to pass the balloon through the previously stented segment in the proximal part of SVG. During an attempt to extract the wire, the wire torn and the torn piece remained fixed at the edge of the stent. Despite our attempts to cover the piece with implantation of a new stent, we were not successful. We performed a CT angiography, which revealed the 9 mm piece of wire fixed at the proximal stent. A repeated coronary angiogram revealed a piece of the wire firmly fixed at the stent (Figure 4A).

The patient was re-admitted with exertional stable angina in June 2014. Coronary angiography revealed closed OM2 SVG and CTO of LCX after OM1. RCA remained patent with collaterals from RCA on LCX OM3 (Rentrop 2). In LAD
there was no important stenosis (Figure 4). The attempted anterograde PCI of OM2 SVG was not successful. We decided for anterograde PCI of CTO LCX. LCX was successfully stented (Figure 5). Even the retrograde PCI of SVG was not successful. Retrograde passage of the dilatation balloon, similar to the previous anterograde attempts, was not possible (Figure 5B).

3. Discussion

Treating a patient like ours faces us with three main challenges: First, we have to decide if the patient is suitable for any kind of additional revascularization. Second, we have to choose between re-operation and PCI and third, if we had decided for PCI, we have to choose the site of our intervention between the native artery and SVG.

Revascularization procedure is by no doubt justified, if the patient remains symptomatic despite optimal medical treatment and if the benefits outweigh any possible risks. The risks for both, the surgical and percutaneous treatment, can be determined by using EuroSCORE system. In choosing between reoperation and PCI, we can relay on SYNTAX Score, which quantifies possible risks of percutaneous treatment [7]. We have to be aware that re-operation poses an additional risk in comparison to the first time CABG. Re-operated patients are more prone to longer intensive care treatment, longer mechanical ventilation, have greater risk for creatin-kinase elevation and post procedural myocardial infarction [8]. For late graft failure, ESC guidelines recommend PCI as the first method of choice, rather than re-operation. CABG should, however, be considered for patients with several diseased grafts, reduced left ventricular function and several CTOs [7]. Considering this, and the young age of our patient, we decided for reoperation at first re-revascularization attempt, but at the next reoccurrences, we decided for PCI.

In selecting the PCI targets, guidelines recommend native coronary artery as the first choice [7]. Procedure in SVG may frequently be accompanied by distal embolization, which can be, if severe, further complicated by occurrence of anginal pain and NSTEMI [5]. Procedure in SVG is also associated with lower long-term success and higher rates of repeated target vessel revascularization [6]. PCI of the SVG itself should, however, still remain an option. In case it is feasible, it should be provided, especially in an acute phase of SVG closure. SVG PCI strategy might be a better choice also in a case of a long and heavily calcified lesion or CTOs of the native coronary artery [4, 9]. In case of a SVG PCI failure, we may still provide a native coronary artery PCI.

In our patient we decided to preform PCI of SVG and PCI of RCA CTO as a staged procedure. First we successfully treated SVG. Nucleotide scan ischemia supported our decision for RCA CTO PCI. After occlusion of stented SVG and unsuccessful PCI we finally performed PCI of LCX CTO.
Long-term survival results of surgical re-operation and PCI are comparable [7]. In PCI alone, the long-term results are worse in case of a long lesions treatment, diffuse coronary disease and concomitant diseases (diabetes, renal failure). The durability of PCI is better in case of PCI interventions in native arteries compared to SVGs [6]. Our patient experiences repeating episodes of ischemia. After two CABG we have performed multiple PCI procedures in SVG to OM2, CTO RCA and finally on CTO LCX.

4. Conclusions

Treating a patient with reoccurrence of ischemia after the previous CABG remains complex. In choosing an optimal treatment, we must follow the current guidelines, but also consider individual characteristics of the patient and hospital resources. In case of repeated coronary re-vascularization it is reasonable to treat just ischemic regions with concomitant coronary arteries. In case of the previous CABG, PCI might be a more reasonable solution for ischemia treatment. In case of a multi vessel disease and SVG closure, a staged procedure is mandatory. PCI priority in a staged revascularization strategy should be driven by ischemia. Optimal PCI decisions should also be based on functional coronary flow measurements.

We also should be aware of the progressive nature of the disease, consequently limited positive long-term results and an often need for a new procedure.

References


PCI strategy in a patient with multi venous grafts failure

Figures

Figure 1. Diagnostic coronary angiography 2011. LM, LAD without significant stenosis (C). CTO proximal LCX (A), CTO proximal RCA (B), occlusion of the SVG-OM2 and RCA (not shown).

Figure 2. PCI of occluded SVG on OM2 (A). Anerograde approach. RJ 4.0 6F, BMW wire, predilatations with baloons Track 2.5x15 mm and 3.0x15 mm (B). Three BMS (Vision 3.5x26 mm, 3.5x23 mm, 3.0x23 mm, Abbott) and one DES (Xience V 3.5x26 mm, Abbott) were implanted (C). Primary result with TIMI3 flow.
Figure 3. Combined anterograde and retrograde approach was used for RCA recanalization (A,B). PTCA with NC balloon (HIRYU (Terumo) 3.0x15 mm, 28 atm) was not successful (C). Before stenting, rotablation of the lesion in the distal RCA was performed with anterograde (Burr: Rotalink 1.50 (Boston Scientific)) (D). Final result with anterograde coronary angiography and simultaneous RCA-LAD coronary angiography (E, F).
Figure 4. Coronary angiography 2014. LAD patent (B). LCX-OM2 VG occluded (A), LCX CTO with visible microchannel to OM2. RCA patent (C) with right to left (OM distalis) collateral flow (Rantrop 2) (D). OM2 VG: note a piece of wire in proksimal part (A).
Fig 5. PCI CTO LCX (A). Anterograde approach: LJ 7F 4.0 (Cordis), wires: BMW (Abbott) in distal LAD, whisper L (Abbott) and microcatheter (MC) Finecross 130 cm (Terumo). With the support of MC a Miriclebros 3 (Abbott) wire crossed the occlusion in true distal lumen. Miraclebros 3 wire was changed for whisper L (B). Baloon valvuloplasty was performed by balloons MiniTreck 1.5x15 mm and 2.5x15 mm (Abbott). LCX was stented proximally by Xience V 3.0x23mm and in extension by Xience V 2.75x15 mm (Abbott) (C). Retrograde attempt of PCI of OM2 was not successful (B). Note occluded VG to OM2 (vg) with patent stent (s, stented in 2009).

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