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CASE REPORT / ПРИКАЗ БОЛЕСНИКА

"TAP" technique on bifurcation lesion of the Y graft in a patient with NSTEMI complicated with cardiogenic shock

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SUMMARY

Introduction Bifurcation lesions on venous Y grafts are rare. We present a case of a woman who developed non-ST segment elevation myocardial infarction complicated by cardiogenic shock due to a bifurcation lesion on the venous Y graft for left anterior descending artery (LAD) and ramus circumflex artery (RCX).

Case outline A 72-year-old woman was admitted to the coronary care unit as an emergency in September 2017 due to acute heart failure followed by the development of cardiogenic shock. Urgent coronarography revealed severe atherosclerotic disease of native coronary arteries with significant bifurcation lesion on venous Y graft for LAD and RCX (medina classification of 1,1,1) with thrombolysis in myocardial infarction (TIMI) grade 2 flow. According to the general condition of patient, a life-saving *ad hoc* percutaneous coronary intervention (PCI) was performed. Two stents were implanted in the Y graft with T and protrusion (TAP) technique achieving optimal result followed with patient stabilization. On one-year follow-up, the patient was without symptoms of angina, and computed tomography coronarography revealed patent both stents in the Y graft. To the best of our knowledge, this is the first described TAP technique used on the Y graft.

Conclusion The PCI on a vein graft is not uncommon either in elective cases or in cases with acute coronary syndrome due to the poorer persistence and more frequent progression of atherosclerotic disease in the venous grafts. The use of bifurcation techniques for the treatment of lesions on a vein graft and especially on the Y graft is rare, but it can be used the same way it is used in native vessels.

Keywords: PCI; Y graft; TAP technique

INTRODUCTION

In routine practice, percutaneous coronary intervention (PCI) of bifurcation lesions in native coronary vessels is found in about 15–20% of cases [1]. However, the incidence of bifurcation lesions on venous Y grafts is rarely found. The use of Y grafts in surgical myocardial revascularization is not so common. They are mainly used when the vein grafts (VG) are of lower quality or when it is desirable to reduce manipulation on the aorta altered by atheromas [2]. PCI on venous grafts is known to be more associated with short-term as well as long-term adverse events when compared to native blood vessels [3]. Especially challenging are bifurcation lesions on the Y graft that lead to the acute coronary event. Practically, such lesions are in some cases equivalent to lesions on the left main coronary artery. In consequence, a larger area of the myocardium is affected by ischemia, which is more often followed by serious complications such as the development of cardiogenic shock, malignant rhythm disorders, or fatal outcome.

Herein, we present a case of a woman who developed non-ST segment elevation myocardial infarction (NSTEMI) complicated by cardiogenic shock due to a bifurcation lesion (medina classification 1,1,1) on the venous Y graft for left anterior descending artery (LAD) and ramus circumflex artery (RCX).

CASE REPORT

A 72-year-old woman was admitted to the coronary care unit (CCU) as an emergency in September 2017 due to the acute heart failure followed by the development of cardiogenic shock. Dyspnea discomforts occurred suddenly around one hour before arriving in the emergency room.

It was a patient who underwent coronary artery bypass grafting (CABG) in 2008 [LAD – left internal mammary artery (LIMA), VG at right internal mammary artery (RIMA) and obtuse marginal (OM) artery]. Due to unstable angina pectoris, she underwent recoronarography in March 2017 when severe multivessel coronary artery disease of the native blood vessels was registered as well as LIMA occlusion, and VG subocclusion on RIMA, while the only graft without significant lesions was on RCX–OM (Figure 1).

In March 2017, emergency surgical myocardial revascularization with three venous grafts [LAD, RIMA, right coronary artery – posterior

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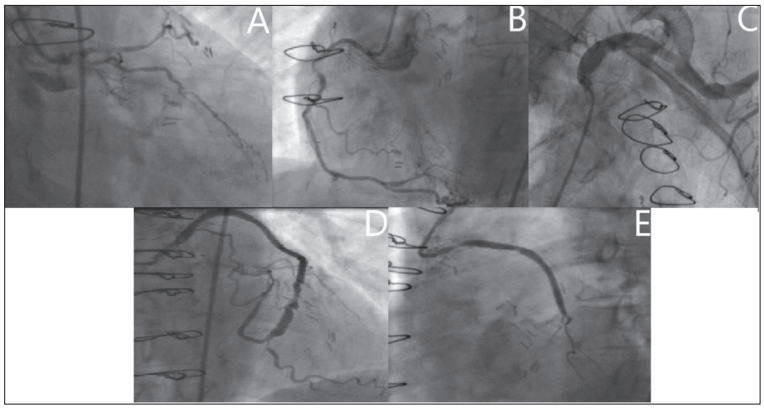

Figure 1. A) Acute coronary syndrome system – the left main 90%, subocclusion of the proximal left anterior descending artery and occlusion of distal segment of the ramus circumflex artery (RCX) [right anterior oblique (RAO) 1, caudal (CAU) 36); B) right coronary artery – proximal segment significantly changed [left anterior oblique (LAO) 42, CAU 3]; C) left internal mammary artery – occluded (RAO 46, CAU 3); D) vein graft on RCX–OM (obtuse marginal artery) – without significant lesions (RAO 3, cranial 24); E) vein graft on the right internal mammary artery – subocclusion in the proximal segment (LAO 43, CAU 2)

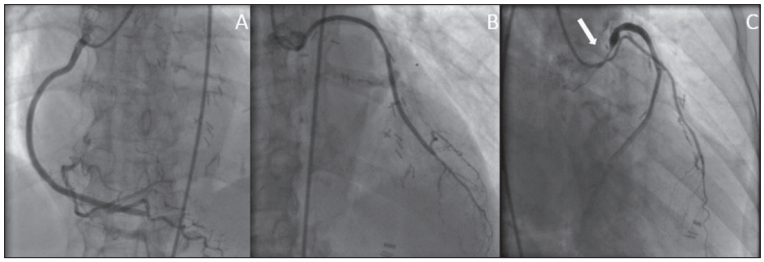

Figure 2. A) Vein graft (VG) for right internal mammary artery – without significant lesions [right anterior oblique (RAO) 9, caudal (CAU) 19]; B) VG for right internal mammary artery – without significant lesions (RAO 2, cranial 24); C) Y graft for left anterior descending artery and ramus circumflex artery – bifurcation lesion of medina 1,1,1 (right anterior oblique 37, CAU 5) – arrow is pointing to the lesion

descending artery (RCA–PD)] was performed. Since the aorta was altered by atheromas and venous grafts were of poor quality, Y graft technique was done and the venous graft on the LAD was sutured to the proximal segment of the venous graft for OM from 2008.

Immediately after the admission to the CCU in September 2017, the intensive treatment began. The patient was sedated, intubated, and supported by invasive mechanical ventilation. Medication circulatory support was also introduced (noradrenaline 0.5 μg/kg/minute and dobutamine 10 μg/kg/minute) in order to achieve hemodynamic stabilization. Non-invasive diagnostics were performed. Emergency echocardiography examination registered a fall in ejection fraction (EF) from the previous 60% to 48% and new abnormalities of segmental kinetics in the form of inferolateral akinesia and hypokinesia partly medially and apically anterolaterally. There was also a significant increase in myocardial necrosis markers.

After the performed emergency diagnostics, it was concluded that it was NSTEMI, which was complicated by cardiogenic shock. Therefore, following the recommendations, urgent coronarography was indicated and performed.

Urgent coronarography finding showed the significantly altered acute coronary syndrome (ACS) system, significant lesion on the left main (LM) artery, proximal subocclusion of LAD, the occlusion of RCX in the proximal segment, as well as the occlusion of native RCA, while it showed the VG for RCA and RIMA patency. It was also registered that the venous graft for LAD was sutured to the graft for RCX, whose patency had been shown by the previous coronarography. The bifurcation lesion of medina classification 1,1,1 developed with thrombolysis in myocardial infarction (TIMI) grade 2 flow at the insertion of the venous graft for LAD to the venous graft for RCX (Figure 2).

According to the general condition of the patient who was in a state of cardiogenic shock, intubated, and mechanically ventilated as well as on medication circulatory support, a life-saving PCI was performed.

Since it was the bifurcation lesion that, in this case, was the equivalent of the LM, it was decided to go up front with the two-stent technique. Two guidewires were placed (Runthrough, Terumo, Tokyo, Japan) and after the predilatation of both grafts, the T and protrusion (TAP) technique was performed with the implantation of two stents. Firstly, drug-eluting stent (DES) (Coroflex ISAR NEO, B. Braun Melsungen AG, Melsungen, Germany) 3.5 × 16 mm with inflation on 18 atmospheres (atm) was implanted in VG for RCX. Afterwards, proximal optimization technique (POT) was performed with non-complaint (NC) balloon 4.5 × 12 mm (Quantum Apex, Boston Scientific, Marlborough, MA, USA) with inflation on 20 atm. After successful rewiring through distal strut of the implanted stent towards the VG for LAD, predilatation was performed with low profile balloon (Sprinter Legend, Medtronic, Dublin, Ireland) to open the struts. According to TAP technique propositions, NC balloon 3.5 × 15 mm in size (Quantum Apex, Boston Scientific) was positioned towards the VG for RCX and, with a small protrusion in previously implanted stent, DES 2.25 × 13 mm (Orsiro, Biotronik, Berlin, Germany) was implanted in VG for LAD with inflation on 8 atm. Afterwards, post-dilatation of the ostial part of the stent was performed with an inflation on 16 atm. Next, kissing was performed with an NC balloon in VG for RCX and balloon from the stent in VG for LAD. At the end, final POT was performed with an NC balloon 4.5 × 12 mm in size (Quantum Apex, Boston Scientific) inflated on 20 atm (Figure 3).

During the first 24 hours after the procedure, satisfactory clinical stabilization was achieved, medication circulatory support was stopped, and the patient was extubated. On the 10th hospital day, she was discharged for outpatient treatment.

On the one-year follow-up, the patient had no anginal discomforts, echocardiography registered EF of 55%, with

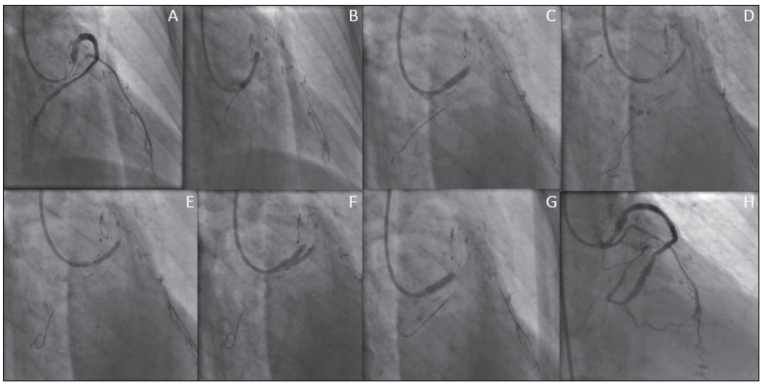

Figure 3. A) Stent positioning in vein graft (VG) for ramus circumflex artery (RCX); B) stent implantation in VG for RCX; C) proximal optimization technique; D) stent implantation in VG for left anterior descending artery (LAD); E) post-dilatation of the ostial part of the stent implanted in VG for LAD; F) kissing; G) final proximal optimization technique; H) final result

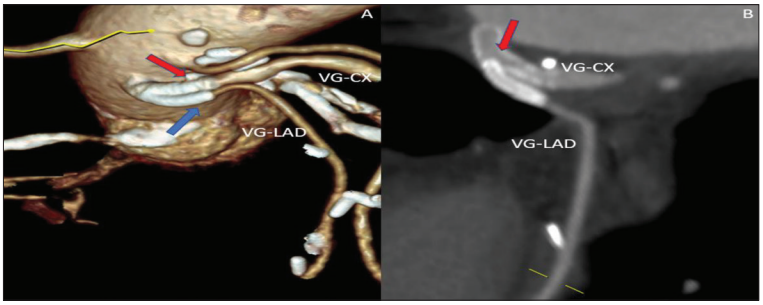

Figure 4. A) CT coronary angiography – 3D reconstruction of the aorta and implanted stents in the Y graft; the red arrow points towards the stent implanted in the vein graft (VG) for ramus circumflex artery (RCX), while the blue arrow points towards the stent implanted in the VG for left anterior descending artery (LAD); B) both patent stents and VGs; the red arrow points towards the area of neo carina

discrete segmental kinetics abnormalities, while CT coronarography registered the potency of stents implanted using the TAP technique into grafts for LAD and RCX (Figure 4).

This case report was approved by the institutional ethics committee, and written consent was obtained from the patient for the publication of the case report and any accompanying images.

DISCUSSION

Treating true bifurcation lesions with percutaneous coronary intervention is a major challenge, primarily because of the selection of an appropriate technique to be followed with fewer potential adverse events. The current European Society of Cardiology guidelines for myocardial revascularization, as well as the 15th consensus from the European Bifurcation Club (EBC), recommend the stent implantation into the main vessel, followed by provisional balloon angioplasty of the side vessel with or without the stent implantation. However, the implantation of two stents is required in 5–20% of cases [4, 5]. No randomized studies addressing the treatment of bifurcation lesions in ACS are available at present. Data are available mainly from registers, the largest of which is the Korean Coronary Bifurcation Stenting (COBIS) registry.

Analyzing data from the COBIS registry, Song et al. [6] found that the outcome of bifurcation PCI in patients with NSTE-ACS and patients with stable angina differed and that patients with NSTE-ACS were associated with the poorer clinical outcome than those with stable angina.

Kim et al. [7] published the first study based on data from the COBIS II registry that compared the long-term clinical outcome (three years) of PCI bifurcation lesions in patients with and without the acute coronary syndrome. It showed that adverse cardiac events were significantly more common with the two-stent technique than the provisional technique in patients with ACS, as opposed to the patients without ACS. Although it should be taken into consideration that this was not a randomized study and that lesions treated with the implantation of two stents had a higher prevalence of more complex lesions, true bifurcations, left main stem (LMS) lesions, as well as multivessel disease.

While the data for selecting one of the techniques for PCI revascularization of bifurcation lesions of native coronary vessels in patients with NSTE-ACS are available, the data for revascularization of patients with Y graft bifurcation lesions can be found sporadically in the literature, primarily through case reports. It is well known that the long-term patency of arterial grafts is significantly better than that of venous grafts. Accordingly, the progression of coronary artery disease in surgically revascularized patients imposes an increasing need for subsequent PCI revascularization of lesions on any of the venous grafts or native blood vessels. According to the study conducted by Redfors et al. [8], there is a significantly higher risk of ischemic adverse events after PCI on VG than in native blood vessels. In some case reports of PCI on the Y graft, various bifurcation techniques have been successfully used, such as DK crush, classic crush, and even the implantation of a dedicated triton bifurcation stent [9, 10, 11].

As there is still no clear consensus on the choice of a technique for revascularization of patients with bifurcation lesions on the Y graft, we were guided by the consensus of the EBC on the revascularization of the LM with a complex bifurcation lesion, and accordingly the decision was made to first stent the vessel with a more pronounced disease, since both branches of the Y graft are of equal importance [2, 5, 12].

According to the available published data in the medical literature, our case is the first to use the TAP technique for the treatment of Y grafts. The decision to use the two-stent technique was made since it was a bifurcation lesion (medina 1,1,1) on the Y graft for LAD and RCX, which was equivalent to a lesion on the LMS.

Given the larger caliber as well as the angle, VG for RCX was taken as the main branch, while VG for LAD was taken as a side branch. In this case, the TAP technique had an advantage over the other two stent techniques due to its lower complexity, which allowed faster revascularization of a highly demanding patient in cardiogenic shock.

Clinical stabilization was soon achieved after the revascularization. During the follow-up, the patient had a satisfactory performance status, without angina, and CT graftography confirmed the patency of the stents in the Y graft.

In our center, more than 1000 primary PCIs are performed per year because of the STEMI, and only 15–20 procedures are performed in VG. According to our data, around 15% are bifurcation lesions which are, in the majority of cases, treated by provisional strategy. Up front two stent techniques are used only when both of the vessels are diseased and of great importance.

In conclusion, although associated with poorer outcomes when compared to the PCI of native vessels, the PCI on VG is not uncommon either in elective cases or in cases with ACS due to the poorer persistence and more frequent progression of atherosclerotic disease in the venous grafts. The use of bifurcation techniques for the treatment of lesions on VG and especially on the Y graft is rare, but it can be used the same way it is used in native vessels.

Conflict of interest: None declared.

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Техника *TAP* на бифуркационој лезији графта *Y* код болесника са *NSTEMI* компликованим кардиогеним шоком

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САЖЕТАК

Увод Бифуркационе лезије на венском *Y* графту се ретко налазе. Приказали смо случај болеснице која је развила *NSTEMI* компликован кардиогеним шоком због бифуркационе лезије на *Y* графту за *LAD* и *RCX*.

Приказ болесника Болесница старости 72 године примљена је као хитан случај у коронарну јединцу због акутне срчане инсуфицијенције праћене развојем кардиогеног шока. Ургентном коронарографијом је регистрована тешка вишесудовна коронарна болест нативних суда као и сигнификантна бифуркациона лезија на венском *Y* графту за *LAD* и *RCX* (медина класификације 1,1,1) са тромболизом код инфаркта миокарда (*TIMI*) протока 2. Сходно општем статусу болеснице урађена је спасавајућа *ad hoc* перкутана коронарна интервенција. Два стента су имплантирана техником *TAP* постижући оптималан резултат, након чега се убрзо постигла стабилизација општег стања. На годишњој контроли болесница је била без ангинозних тегоба, а *CT* коронарографијом регистрована су проходна оба стента имплантирана у *Y* графт. Према нашим сазнањима, ово је први описани случај технике *TAP* коришћене на *Y* графту.

Закључак Перкутана коронарна интервенција на венском графту није ретка ни код елективних случајева, ни код акутног коронарног синдрома, због мање постојаности као и чешће прогресије атеросклеротске болести на венском графту. Примена бифуркационих техника за третман лезија на венским графтовима а посебно *Y* графту је ретка, али се може користити по истом принципу као и на нативним судовима.

Кључне речи: перкутана коронарна интервенција; графт *Y*; техника *TAP*