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**Case Report / Приказ болесника**

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**“TAP” technique on bifurcation lesion of Y graft  
in a patient with NSTEMI complicated with cardiogenic shock**

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

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## “TAP” technique on bifurcation lesion of 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 presented a case of a woman who developed NSTEMI complicated by cardiogenic shock due to a bifurcation lesion on the venous Y graft for LAD and RCX.

**Case outline** A 72-year-old woman was admitted to the CCU as an emergency in September 2017 due to the 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 TIMI 2 flow. According to the general condition of patient, a life-saving *ad hoc* PCI was performed. Two stents were implanted in Y graft with T and protrusion technique achieving optimal result followed with patient stabilization. On one-year follow-up patient was without symptoms of angina, and CT coronarography revealed patent both stents in Y graft. Best to our knowledge this was the first described TAP technique used on Y graft.

**Conclusion** 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.

**Keywords:** PCI; Y graft; TAP technique

### 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 јединицу 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 *TIMI* 2 протоком. Сходно општем статусу болеснице урађена је спасавајућа *ad hoc* перкутана коронарна интервенција (ПКИ). Два стента су имплантирана техником *TAP* постижући оптималан резултат, након чега се убрзо постиже стабилизација општег стања. На годишњој контроли болесница је без ангионозних тегова, а *CT* коронарографијом се региструју проходна оба стента имплантирана у *Y* графт. Према нашим сазнањима ово је први описани случај *TAP* технике коришћене на *Y* графту.

**Закључак** ПКИ на венском графту није ретка како код елективних случајева тако и код акутног 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 може се користити по истом принципу као и на нативним судовима.

**Кључне речи:** ПКИ; графт *Y*; техника *TAP*

### 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 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 the short-term as well as long-term adverse events when compared to the 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, the 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 NSTEMI complicated by cardiogenic shock due to a bifurcation lesion (medina classification 1,1,1) on the venous Y graft for LAD and RCX.

## CASE REPORT

A 72-year-old woman was admitted to the 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-LIMA, VG at RIM and OM). 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 RIM, 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, RIM, 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 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 mcg / kg / min and

dobutamine 10 mcg / kg / min) in order to achieve hemodynamic stabilization. Non-invasive diagnostics were performed. Emergency echocardiography examination registered a fall in EF from the previous 60% to 48% and a 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.

The urgent coronarography finding showed the significantly altered ACS system, significant lesion on LM, 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 RIM 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 TIMI 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 left main, it was decided to go up front with the two-stent technique. Two guidewires were placed (Runthrough, Terumo, 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, Germany) 3.5 x 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 x 12 mm (Quantum Apex, Boston Scientific, 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, USA) to open the struts. According to TAP technique propositions, NC balloon 3.5 x 15 mm (Quantum Apex, Boston Scientific, USA) was positioned towards the VG for RCX and, with a small protrusion in

previously implanted stent, DES 2.25 x 13 mm (Orsiro, Biotronik, Germany) was implanted in VG for LAD with inflation on 8 Atm. Afterwards, post-dilatation of ostial part of the stent was performed with an inflation on 16 Atm. Next, kissing was performed with NC balloon in VG for RCX and balloon from the stent in VG for LAD. At the end, final POT was performed with NC balloon 4.5 x 12 mm (Quantum Apex, Boston Scientific, USA) 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 55%, with 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 this case report and any accompanying images.

## DISCUSSION

Treating the 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 ESC 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 COBIS registry.

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

Kim et al. published the first study based on data from the COBIS II registry that compared the long-term clinical outcome (3 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 [7].

While the data for selecting one of the techniques for PCI revascularization of bifurcation lesions of native coronary vessels in patients with NSTEMI-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 Redford et al., there is a significantly higher risk of ischemic adverse events after PCI on VG than in native blood vessels [8]. In some case reports of the 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 Club on the revascularization of the left main 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 the lesion on the LMS.

Given the larger caliber as well as the angle, VG for RCX was taken as main branch (MB), while VG for LAD was taken as side branch (SB). In this case T and protrusion technique had advantage in regard to other two stent techniques due to its less complexity, which allowed faster revascularization of highly demanding patient in cardiogenic shock.

Clinical stabilization was soon achieved after the revascularization. During the follow-up, the patient had 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 vein grafts. 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.

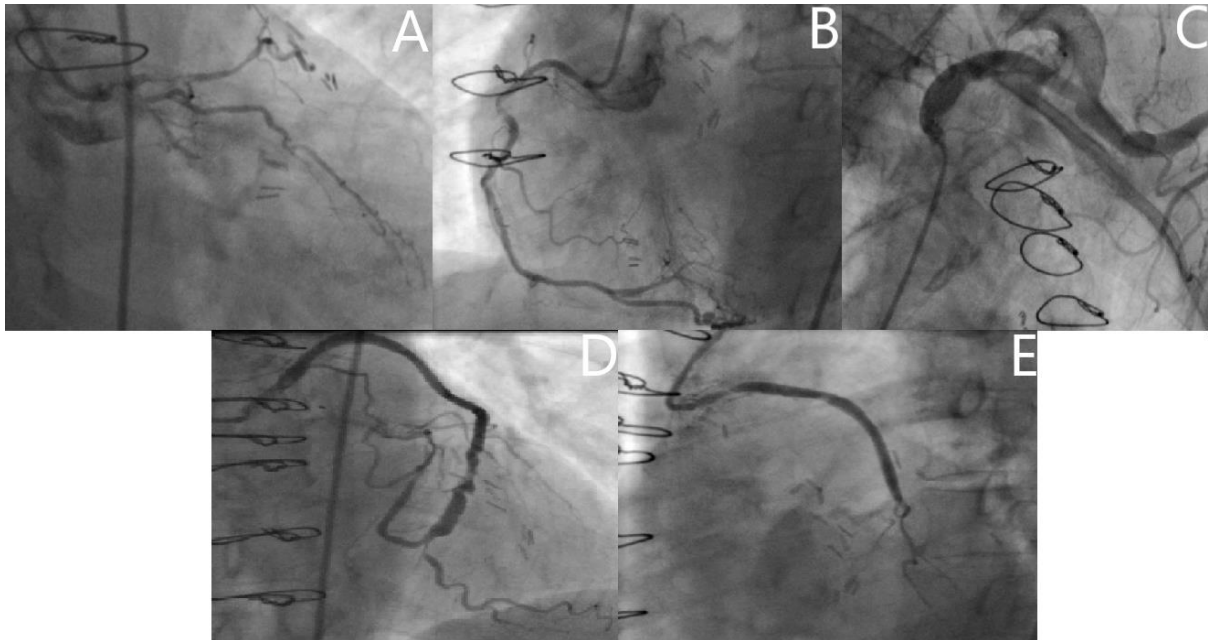
In the conclusion, although associated with poorer outcomes when compared to the PCI of native vessels, the PCI on VG is not uncommon either in elective cases or in cases with ACS due to the poorer persistence and more frequent progression of atherosclerotic disease in the venous grafts. The use of bifurcation 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.

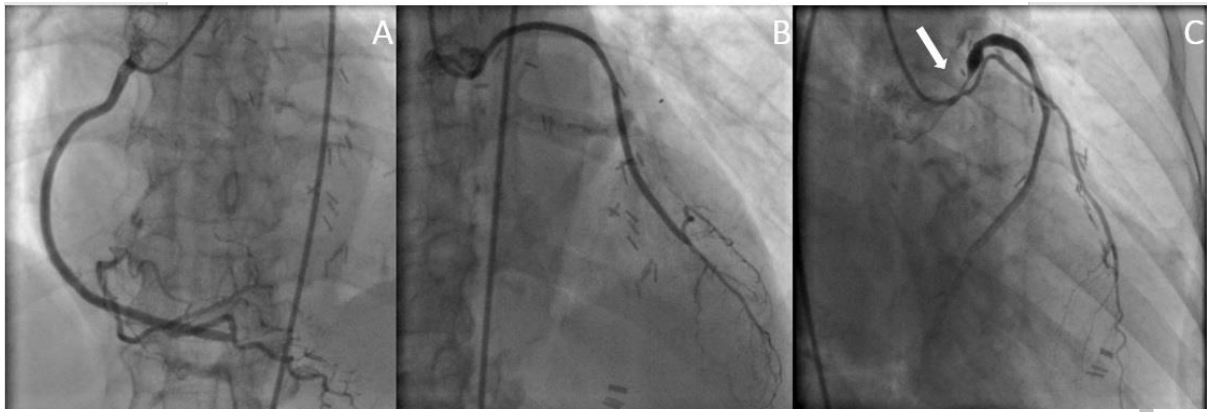
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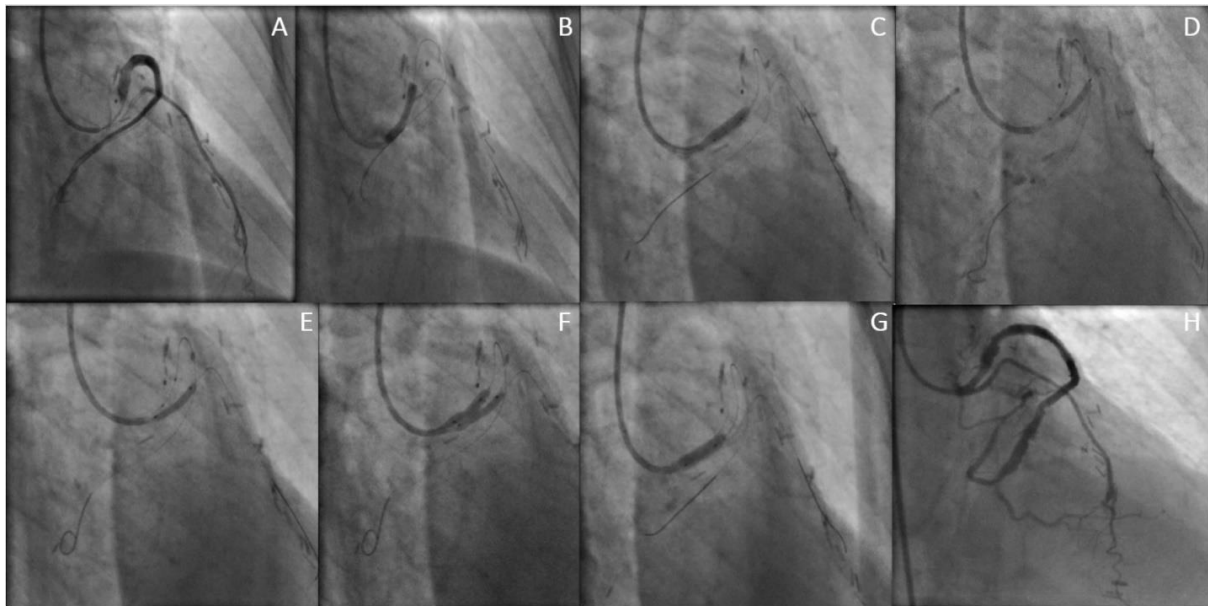


**Figure 1.** A) ACS system – the left main 90%, subocclusion of the proximal LAD and occlusion of distal segment of RCX (RAO 1 CAU 36); B) RCA – proximal segment significantly changed (LAO 42 CAU 3); C) LIMA – occluded (RAO 46 CAU 3); D) VG on RCX-OM – without significant lesions (RAO 3 CRAN 24); E) VG on RIM – suboccluded in the proximal segment (LAO 43 CAU 2)

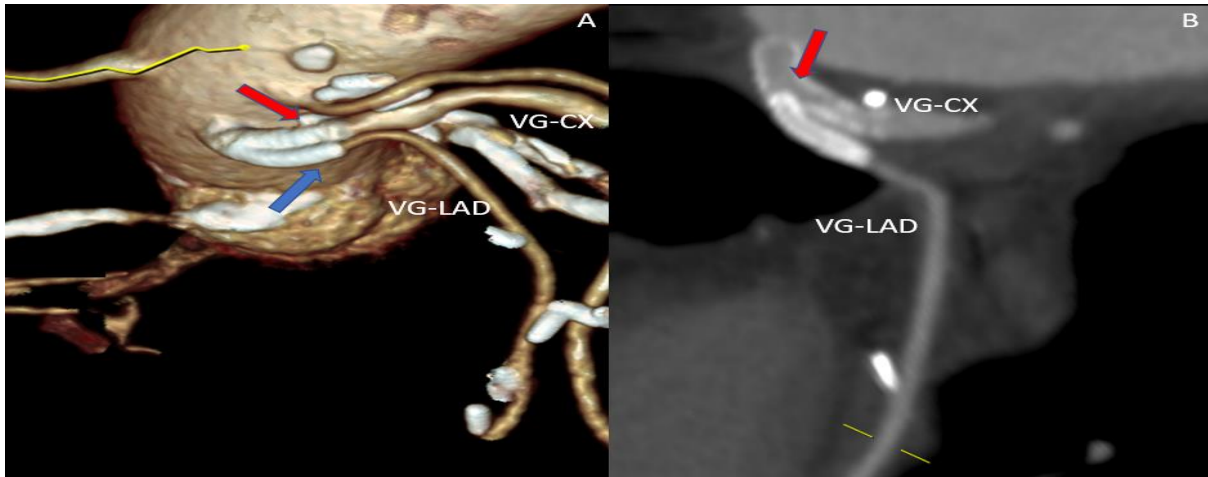


**Figure 2.** A) VG for RCA – without significant lesions (RAO 9 CAU 19); B) VG for RIM – without significant lesions (RAO 2 CRAN 24); C) Y graft for LAD and RCX – bifurcation lesion of Medina 1,1,1. (LAO 37 CAU 5) – arrow is pointing to the lesion

Paper accepted



**Figure 3.** A) Stent positioning in VG for RCX; B) stent implantation in VG for RCX; C) POT; D) stent implantation in VG for LAD; E) post-dilatation of the ostial part of stent implanted in VG for LAD; F) kissing; G) final POT; H) final result



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