Chronic total occlusion in ostium of right coronary artery – retrograde approach as the first-choice method of revascularization?

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Abstract

Recanalization of chronic total occlusion (CTO) located in the ostium may require the operator's ability to use the retrograde approach. We present a case of opening a chronically occluded right coronary artery (RCA) by the retrograde approach after an unsuccessful attempt of recanalization by classic antegrade technique.

Key words: chronic total occlusion, retrograde technique, recanalization.

Introduction

Long-term analysis and clinical observation allows separation of prognostic factors influencing successful recanalization of chronic total coronary occlusion [1]. Localization and length of occlusion, the presence and severity of calcification, and presence of collaterals and side branches at the site of the occlusion correlate with the success rate of recanalization in the case of procedures using the classic antegrade technique. Ostial coronary artery occlusion is a particular form which is inter alia included in the SYNTAX Score algorithm. Streamlining this type of occlusion is difficult and may require the use of retrograde techniques. We present a case of a patient with chronic ostial coronary artery occlusion, treated by the *retrograde method*, after failure of the classic *antegrade method*.

Case report

The case concerns a 59-year-old male patient, with obesity, numerous ischemic heart disease factors (hypercholesterolemia, arterial hypertension, diabetes mellitus type 2 treated by diet), with a history of inferior wall myocardial infarction (MI) in the past, with exertional chest pain (CCS III) for 3 months. The exercise test performed in ambulatory care was clinically positive at the workload of 9 METs. Echocardiographic examination revealed normal ejection fraction (EF – 60%). In resting ECG there was no pathological q after MI but a negative T wave in lead I, aVL, V5 and V6 was found. Coronarography performed in a peripheral cath lab on 29.04.2011 revealed occlusion in the proximal segment of the right coronary artery (RCA) and no significant findings in the left coronary artery (LCA). The operators decided to perform the procedure of opening the RCA. For RCA intubations they used a JR 4.0 6 Fr catheter. After insertion of the BMW guide wire into the artery ventricular fibrillation occurred. After successful resuscitation the operators stopped the procedure. Primarily the patient was qualified for pharmacological treatment of ischemic heart disease, but because of persistent complaints (CCS angina class III), the patient was qualified for PCI in a reference center (Figure 1).

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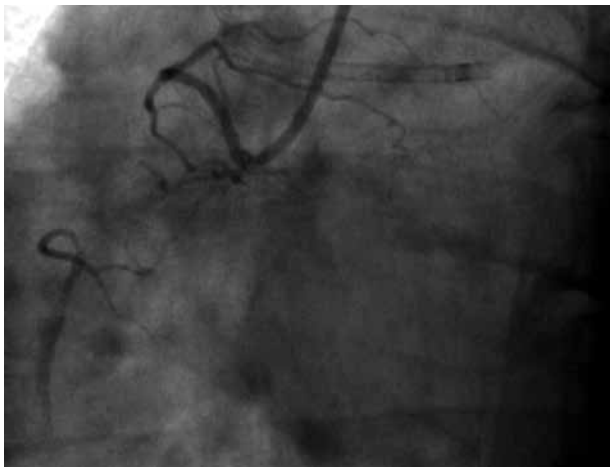

Fig. 1. Injection of contrast media to RCA. There is occlusion in ostium of RCA, located directly to conus artery

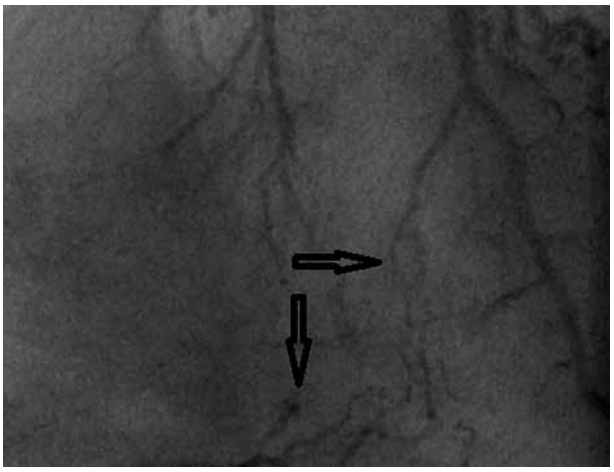

Fig. 2. Injection of contrast media to left coronary artery. Arrows show septal artery connected with distal part of RCA

The patient was admitted to the First Department of Cardiology, Interventional Electrocardiology and Hypertension of Jagiellonian University Medical College in Krakow 14 months after the last attempt of recanalization. Two arterial accesses were obtained, the main one from the right femoral artery. For visualization of the proximal segment of the RCA contralateral injections to the LCA were performed. For this reason, for intubations of the LCA a left Amplatz 4.0 7 Fr (Medtronic Vascular, USA) with side holes was used. The attempt of streamlining the occlusion by an antegrade method with a Fielder XT guidewire (Asahi Intecc, Japan) introduced on an OTW ("over the wire") balloon was unsuccessful. Because of unfavorable morphology, small chance of success using the classical antegrade method, and the presence of the perforator connecting with the distal segment of the RCA (Figure 2), the operator decided to apply the retrograde method.

For the needs of the retrograde method the operator used an EBU 4.0 7 Fr with side holes (Medtronic Vascular, USA) to the LCA. By means of a BMW guidewire with 150 cm length (Abbott Vascular, USA) a Corsair microcatheter (Asahi Intecc, Japan) was introduced into the sep-

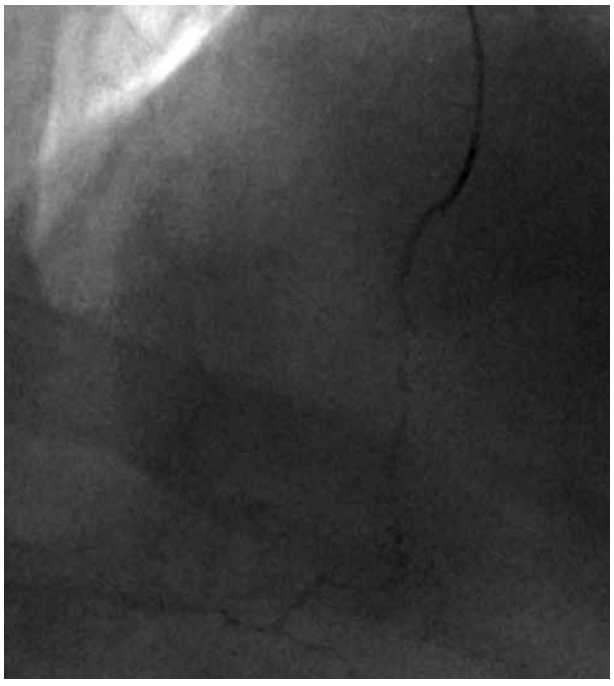

Fig. 3. Selective injection of contrast medium through Corsair microcatheter showed connection between septal branch and right coronary artery

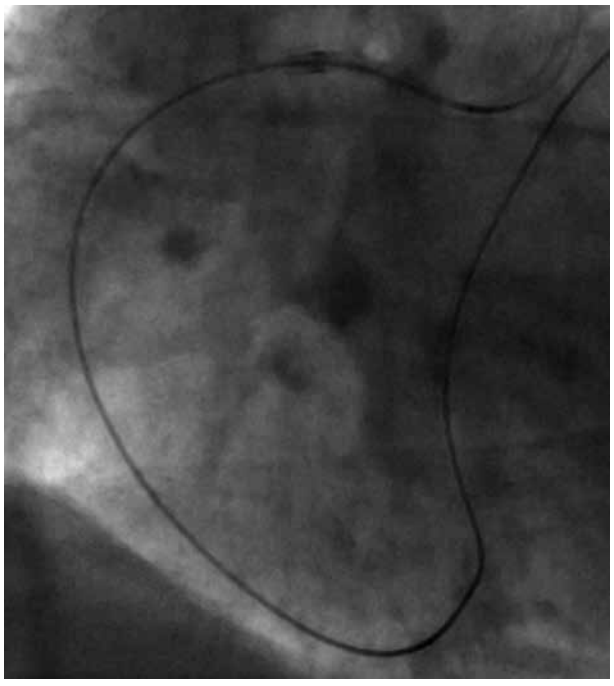

Fig. 4. When Corsair microcatheter reached ostium of RCA, Sion guidewire was changed for RG3 guidewire (330 cm)

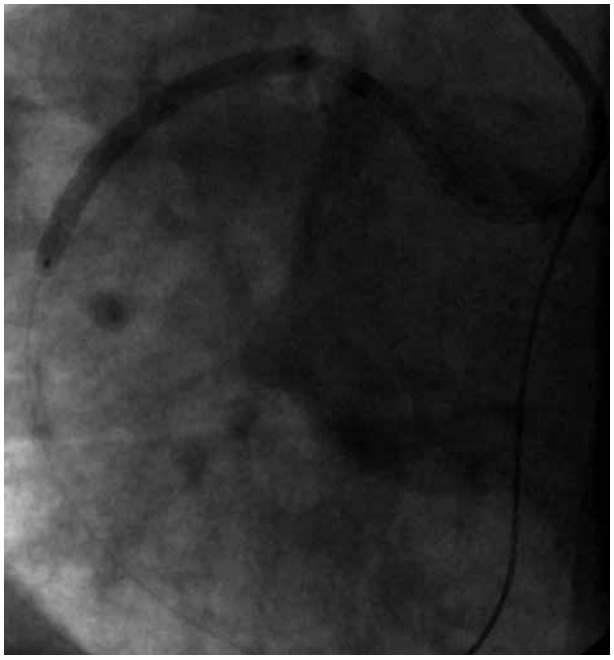

Fig. 5. Stent implantation – Promus Element 3.0 mm × 38 mm – 18 atm

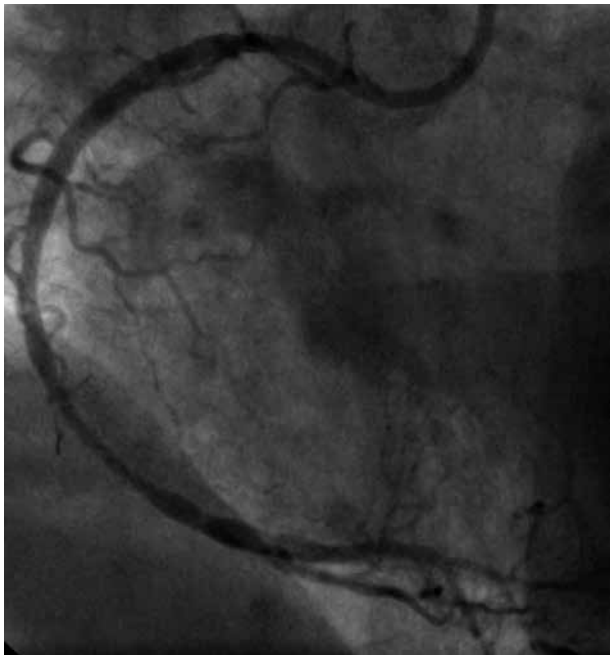

Fig. 6. Injection of contrast medium after stent implantation. TIMI 3 flow

tal branch. Then the BMW wire was replaced by a Sion wire (Asahi Intecc, Japan), which was put in the septal branch. Connection with the distal portion of the RCA was confirmed by selective contrast media injection to a microcatheter (Figure 3). The Sion was led to the distal segment of the RCA and passed backward through the occlusion to the catheter used for contralateral injections in the RCA (Figure 4).

After the insertion of a Corsair microcatheter to the proximal part of the guiding catheter, the Sion was replaced for an Asahi RG3, with the length of 330 cm (Asahi Intecc, Japan) – dedicated for externalization. The RG3 was drained out by arterial access on the left side.

Then, by the antegrade technique, a few sequential balloon inflations by Maverick (Boston Scientific, USA) 1.5 mm × 20 mm and 2.5 mm × 20 mm, to a maximum of 12 atm, were performed. After visualization a Promus Element stent (Boston Scientific, USA) 3.0 mm × 38 mm, 18 atm, was inserted (Figure 5). The result was evaluated as the optimal treatment with TIMI 3 flow (Figure 6). The procedure time was 75 min, 500 ml of contrast media was used, fluoro-time 27.3 min, radiation dose 3.4 Gy. The post-procedural course was uncomplicated. The next day after the procedure the patient was discharged home in good general condition, with the instruction to take optimal pharmacotherapy. A year after the procedure the patient does not report angina symptoms and the test exercise is negative.

Discussion

Chronic total occlusions still remain a challenge for interventional cardiologists. Advantages of the opening of chronic occlusion in patients whose ischemic myocardial area is confirmed alive include relief of angina, reduction of the incidence of arrhythmias, improved left ventricle contractility and lower mortality [1, 2]. The patency of the right coronary artery, especially in patients with reduced ejection fraction and changes in other coronary arteries, is significant. In patients undergoing unprotected left main percutaneous coronary artery angioplasty in which there was a right coronary artery occlusion the 3-year observation showed higher mortality from cardiac causes compared with patients without significant changes in the RCA (respectively 30.0% vs. 6.7%) [3].

The operator experience, knowledge about the equipment, the ability to use different streamlining techniques and proper patient selection can achieve effectiveness of recanalization of about 90%. Ostial chronic total occlusion is considered exceptionally difficult to manage and often requires modification of techniques. The retrograde method is usually the next step of management after previous unsuccessful recanalization by the classic antegrade method. Although in the present case the operators successfully intubated the right coronary artery with a guiding catheter, morphology of the lesion and presence of side branches reduced the chances of opening antegradely; hence after the antegrade method the decision was taken to perform a retrograde one. Selecting the right guiding catheter, which gives adequate support and is atraumatic for the artery, is one of the crucial elements of effective recanalization. Due to the good support for recanalization of chronic occlusion of the RCA, a left Amplatz catheter is often used. To reduce

the risk of dissection and damping the operator should apply the catheter version with side holes. In the case of absence of side holes this can be done with a needle. The use of a catheter without side holes in the district hospital at the first attempt of recanalization of the RCA caused ventricular fibrillation which was a consequence of blockage of blood flow in the artery. Another condition for success is to choose the right guidewire. In recent years the first choice guidewire is the Fielder XT (Intecc Asahi, Japan). This guidewire with 0.014" diameter is covered with hydrophilic polymer for the entire length and has a flexible tip at the end, characterized by excellent control. Diameter of the tip of the guide itself is only 0.009". This guide is also recommended in the retrograde method. Due to the presence of collaterals connecting the left coronary artery with the RCA, it was possible to use retrograde techniques. This method has its origins in the late eighties, but its growth and popularization occurred in the year 2000 and in later years [4]. Aforementioned factors reduce the recanalization success but are irrelevant when using the retrograde technique. The only predictor of failure in the retrograde method is unfavorable anatomy of collaterals. In this example there was a visible septal connection that was used for achieving the proximal segment of the RCA. Injection of contrast media to the Corsair microcatheter confirmed choosing the right septal branch. Most frequently operators applying the retrograde method use new guides from Asahi Intecc such as Sion, providing an excellent steering response when passing through collaterals. The new guidewire used in this example was the RG3 guide. This is a guide dedicated to externalization with a diameter of 0.010", covered with a hydrophilic layer which ensures reduction in friction when carrying out procedures through curved coronaries and microcatheters. Because of the increased risk of restenosis in a chronically closed vessel, to optimize the result of the treatment it is recommended, in the absence of contraindications to dual antiplatelet therapy, to implant drug-eluting stents. This provides less frequent occurrence of major cardiac events and less frequent need for revascularization, and reduces incidence of restenosis and reocclusions as compared to metal stents [5]. In short, to succeed in this difficult case of recanalization of chronic ostial RCA occlusion, the following contributed: appropriate selection of guide catheters, the ability to apply new guides and knowledge of CTO techniques, including retrograde techniques. The consensus of the Euro CTO Club for recanalization of chronic occlusions from the year 2012 draws attention to the need for operators to have proper theoretical knowledge and practical experience in CTO recanalization. An independent operator certificate does not automatically translate into the ability to successfully perform recanalization procedures of chronic occlusions. The minimum frequency of CTO recanalization performed by an operator to ensure adequate experience is 50 per year. For this reason, chronic total coronary occlusions should be performed by a limited number of centers and operators [4]. Evaluated in 2011–2013, the average success rate in CTO recanalization of operators belonging to the Euro CTO Club is 82.5%, while in our department this ratio is 84.7%. In Poland, according to data from SISN PTK, the percentage of successfully treated CTOs was 62.6%. Let us hope that the continued refinement of the equipment and the growing experience of the operators will further improve the effectiveness of recanalization of chronic total coronary occlusion.

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