Percutaneous retrieval of a detached rotational atherectomy burr

Michał Kosowski[1,2], Wojciech Zimoch[1,2], Piotr Kübler[2], Marcin Wojtczak[2], Artur Telichowski[2], Krzysztof Reczuch[1,2]

[1]Department of Heart Diseases, Faculty of Health Sciences, Wroclaw Medical University, Wroclaw, Poland
[2]Department of Cardiology, Centre for Heart Diseases, Military Hospital, Wroclaw, Poland

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Abstract

Rotablation (rotational atherectomy) is an acknowledged method of percutaneous treatment of highly calcified coronary artery lesions that cannot be treated with traditional angioplasty. The complexity of the technique and usage of very specific equipment can contribute to the development of uncommon complications. We present a case of percutaneous retrieval of a damaged rotational atherectomy burr in a 74-year-old male patient.

Key words: rotablation, rotational atherectomy, intracoronal foreign body removal.

Introduction

Rotational atherectomy is an acknowledged method of percutaneous treatment of highly calcified or fibrotic coronary lesions that cannot be treated with traditional angioplasty [1]. The European Society of Cardiology recommends using rotational atherectomy to prepare lesions that cannot be crossed with the balloon catheter or adequately dilated (recommendation class I, evidence level C) [2]. The complexity of the technique and usage of very specific equipment can contribute to the development of uncommon complications.

We present a case of successful percutaneous retrieval of a damaged rotational atherectomy burr in a 74-year-old man who underwent a procedure on the right coronary artery.

Case report

A 74-year-old man with ESC class 2 arterial hypertension, type 2 diabetes mellitus, K/DOQI (Kidney Disease Outcomes Quality Initiative) stage 4 chronic kidney disease, with a history of three non-ST segment elevation myocardial infarctions (NSTEMI) in 1999, 2000 and 2009, coronary artery bypass surgery (CABG) with LIMA-LAD, Ao-SVG-Cx/OM, Ao-SVG-RCA grafts in 2001, after ischemic stroke, right internal carotid and right renal atherectomy was admitted to the Cardiology Department of the 4th Military Hospital in Wroclaw in order to perform coronary angiography. In anamnesis the patient suffered from stable coronary disease in CCS class II, with escalation of symptoms to CCS class III/IV about 2 weeks before admission. Physical examination revealed no significant abnormalities. ECG showed left axis deviation, normal sinus rhythm 70/min, QS complex in leads V1-V3, and flat-negative T waves in leads I and aVL. BP was 105/70 mm Hg. Laboratory tests revealed normocytic anemia (Hb 11.1 g/dl, HCT 32.5%), estimated glomerular filtration rate (eGFR) 36 ml/min/1.73 m^2, and troponin levels were in the normal range.

Coronary angiography showed numerous calcifications in both coronary arteries, left main (LM) critically stenosed in the distal segment, ostial stenosis and occlusion of the left anterior descending (LAD) artery after the first diagonal (Dg) branch, and circumflex artery (Cx) occluded in the medial segment. The dominant right coronary artery (RCA) was stenosed in the proximal segment with a highly calcified lesion (Figure 1), and the distal segments were stenosed to 30–40%. Patent grafts – LIMA-LAD, Ao-SVG-Cx/OM – were also visible; the graft to the RCA was occluded proximally. The patient was qualified for RCA angioplasty using rotational atherectomy.

A 7 F AL1 guiding catheter was used to intubate the RCA, Cruiser Hydro ES-F (Biotronik) and RotaWire Extra Support (Boston Scientific) guidewires were subsequently introduced into the vessel. A temporary pacing electrode was implant-

Corresponding author:
lek. Michał Kosowski, Department of Heart Diseases, Faculty of Health Sciences, Wroclaw Medical University, 5 Weigla St, 50-981 Wroclaw, Poland, tel.: +48 606 895 229, e-mail: mkosowski@gmail.com
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Fig. 1. Right coronary artery with marked stenosis (LAO 45 CRAN 0)

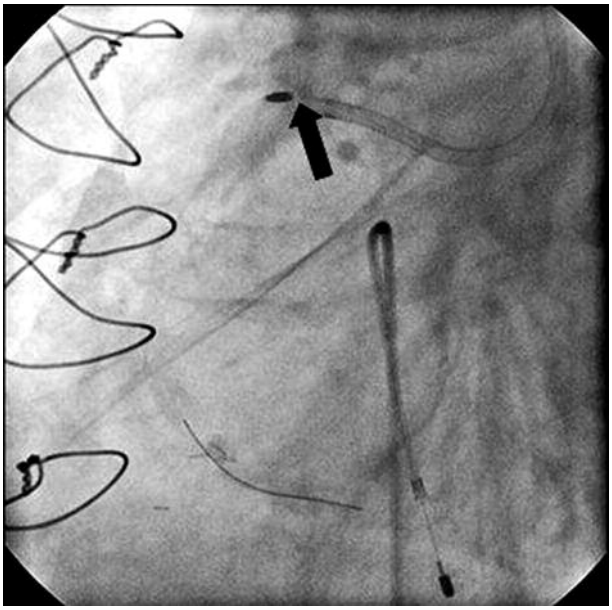

Fig. 2. Damaged rotational atherectomy catheter. The place of burr detachment is marked by an arrow (LAO 45 CRAN 0)

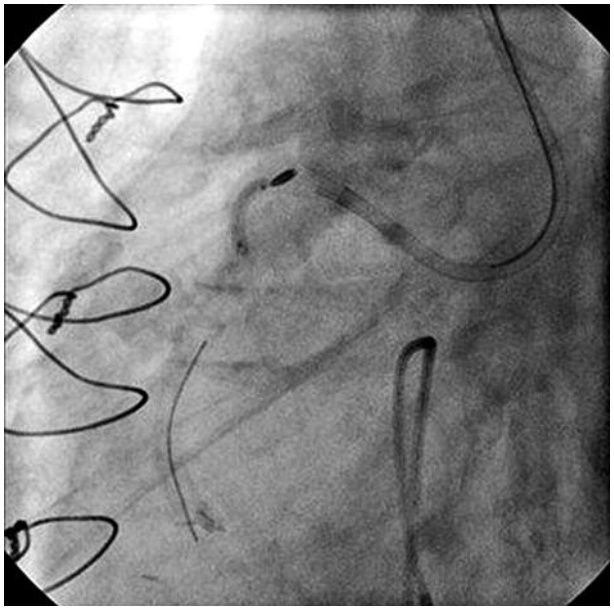

Fig. 3. Coronary balloon dilatated distally to the burr before it was brought back to the guiding catheter (LAO 45 CRAN 0)

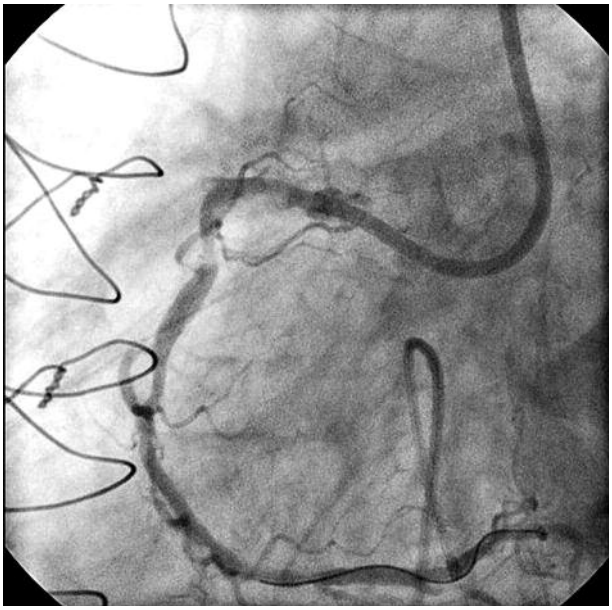

Fig. 4. Preserved flow in RCA after burr retrieval (LAO 45 CRAN 0)

ed. A couple of passages with a 1.5 mm diameter burr (RotaLink Plus, Boston Scientific) at 140 000 revolutions per minute (RPM) were made in the area of the highly calcified, proximal lesion of the RCA. A sudden drop of burr rotation speed was observed during the last passage, followed by a complete stop. The operator was unable to restart the rotational atherectomy system. When an attempt to remove the catheter was made, the burr became detached from the catheter and got stuck in the lesion. The flow through the artery was preserved, though (Figure 2). A decision to remove the detached burr percutaneously, using a balloon catheter, was made. After many attempts a Cruiser Hydro ES-F guidewire and Sprinter Legend RX (Medtronic) 2.0 mm × 10 mm balloon were successfully introduced. After the balloon inflation it was withdrawn, along with the detached burr, to the guiding catheter (Figure 3). All the equipment was removed en bloc from the patient's body. The procedure was continued, but attempts to dilate the lesion with

Sprinter Legend RX 1.25 mm × 6 mm and 2.0 mm × 10 mm failed. Repeated contrast injection showed preserved flow through the artery (Figure 4). The patient was scheduled for the next, elective attempt of rotational atherectomy. The patient was discharged in satisfactory condition, with normal serum troponin I levels and stable renal function (eGFR 42 ml/min/1.73 m^2).

Discussion

A number of complications of intra-coronary interventions are specific for rotational atherectomy procedures [3]. These complications usually involve mechanical interactions between the burr (rotation at high speed) and the artery; there are forces interacting between the individual parts of the system as well. Cases of burr entrapment in the highly calcified lesions and inability to withdraw the burr after passing narrow lesions are well known and have been reported [4–10]. There is also a possibility of guidewire damage done by a burr that remained too long time in the same place and when the treated vessel is tortuous [11, 12]. There are only a few descriptions of complications similar to the one described above (spontaneous burr detachment) available in the literature, mainly in U.S. Federal Food and Drug Administration (FDA) reports [13, 14]. Endo *et al*. described a quite similar case of burr damage and detachment, but they emphasize the possibility of another cause (i.e. other than the burr wedging in a highly calcified lesion) and do not rule out a mechanical device failure [15]. In that case the operators decided on surgical removal of the parts that remained in the LAD. In our case we could not determine the cause of the burr damage. The procedure was performed by a well-trained, experienced team, and all the equipment recommendations were fulfilled. We decided on percutaneous removal of the damaged parts. Authors of descriptions of removal of intracoronary foreign bodies (damaged wires, stents, balloons, etc.) indicate that various tools (loops, retrieval baskets placed on catheters, forceps, etc.) may be used [16–18]. The operators recognized that the odds in favor of successful retrieval of damaged equipment would be the highest if they used an additional guidewire and balloon. According to our experience, the method is safe, efficacious and does not need sophisticated equipment.

In conclusion, we need to emphasize that a number of complications can occur during intra-coronary interventions, especially when a technique such as rotational atherectomy is used. An individual assessment of every complication and proper actions can help to solve every problem in a minimally invasive way, as described in the case above.

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