Complex percutaneous coronary intervention of the left coronary artery with rotational atherectomy in an 84-year-old dialysed patient

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Abstract

Coronary artery disease in patients with end-stage renal disease occurs several dozen times more often than in the general population. Atherosclerotic changes in coronary arteries in dialysed patients are more diffused and calcified, which hampers the percutaneous coronary angioplasty. We present a case of an 84-year-old dialysed patient, in whom complex percutaneous coronary intervention of the left anterior descending artery was performed with the use of rotational atherectomy.

Key words: percutaneous coronary angioplasty, haemodialysis, rotational atherectomy.

Introduction

Ischaemic heart disease occurs nearly 50 times more frequently in patients with chronic renal disease than in the general population. Percutaneous coronary interventions (PCI) are currently frequently employed to treat coronary artery disease and myocardial infarction in patients with renal failure. In specific circumstances, especially when massive calcification is present in the coronary arteries, percutaneous treatment is very difficult and often impossible to perform. In such cases modifying atherosclerotic plaques using rotational atherectomy makes it possible to perform percutaneous revascularisation [1, 2].

Case report

An 84-year-old patient with a multiple-year history of arterial hypertension and coronary artery disease who had previously suffered from two incidents of myocardial infarction was admitted to the Department of Invasive Cardiology for percutaneous revascularisation treatment. Four years earlier the patient had been diagnosed with end-stage chronic renal disease and administered renal replacement therapy (haemodialysis sessions). The cause of the kidney function insufficiency had not been determined but hypertension was considered to be the most probable factor. Four years ago the patient had an inferior myocardial infarction and was treated with right coronary artery (RCA) angioplasty with metal stent implantation.

A month ago the patient was admitted to a district hospital again due to a myocardial infarction without ST segment elevation. Coronarography was performed, which demonstrated multivessel disease with a 30% left main coronary artery stenosis, significant (95%) stenosis in the long segment of the left anterior descending artery (LAD) in two locations, obstructed circumflex artery (CX) in the middle segment, 90% proximal segment of the diagonal branch (DB) stenosis and 95% stenosis in the proximal segment of the intermediate branch (IB). Massive calcification of all coronary arteries was observed (Figures 1 and 2). Simultaneously an attempt at opening the circumflex branch was made, which was unsuccessful due to the lack of possibility of driving the guide through the obstruction. Next a PCI procedure on the LAD was attempted, which was also unsuccessful due to massive calcification that made it impossible to expand the balloon.

Echocardiography performed at the hospital demonstrated slight augmentation of the left ventricle with slight wall hypertrophy, moderate mitral insufficiency, and segmental contractile dysfunction of the left ventricle with inferior and lateral wall akinesis. The ejection fraction was estimated to be 30%.

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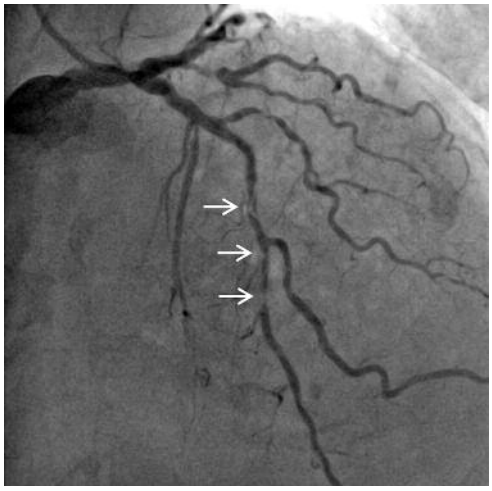

Fig. 1. Coronarography of the left coronary artery – significant stenoses of middle segment of the left anterior descending artery (white arrows)

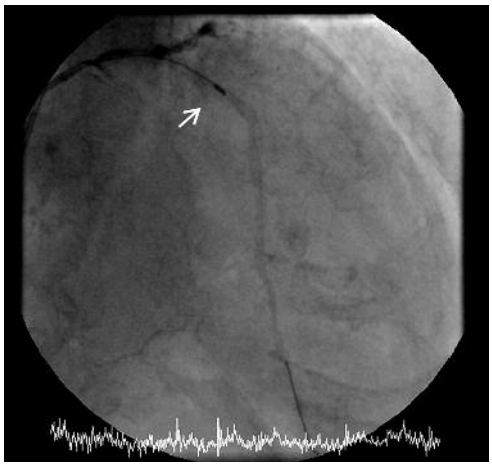

Fig. 3. Rotational atherectomy of the left anterior descending artery (white arrow – rotablator drill)

The decision concerning further revascularisation treatment of the patient was made by the Heart Team. The progression stage of the coronary artery disease was assessed at the level of 33.5 points of the Syntax score. The surgical risk was estimated as 21.24% using the Logistic EuroScore I. The patient was not qualified for cardiosurgical treatment due to a high surgical risk and it was decided to make another attempt at coronary angioplasty of the LAD with rotablation.

The patient was transferred to the Department immediately after a haemodialysis session. Upon admission the patient was in a good general condition with BP 98/50 mm Hg. He reported exertional chest pain (CCS class II/III). Electrocardiogram showed regular sinus rhythm of 75 beats per minute, pathological Q wave in leads II, III and aVF, QS complexes in leads V1–V2, and negative T waves in leads V3–V6.

On the second day of hospitalization PCI on the left anterior descending artery was performed. After the incision

Fig. 2. Coronarography of the right coronary artery

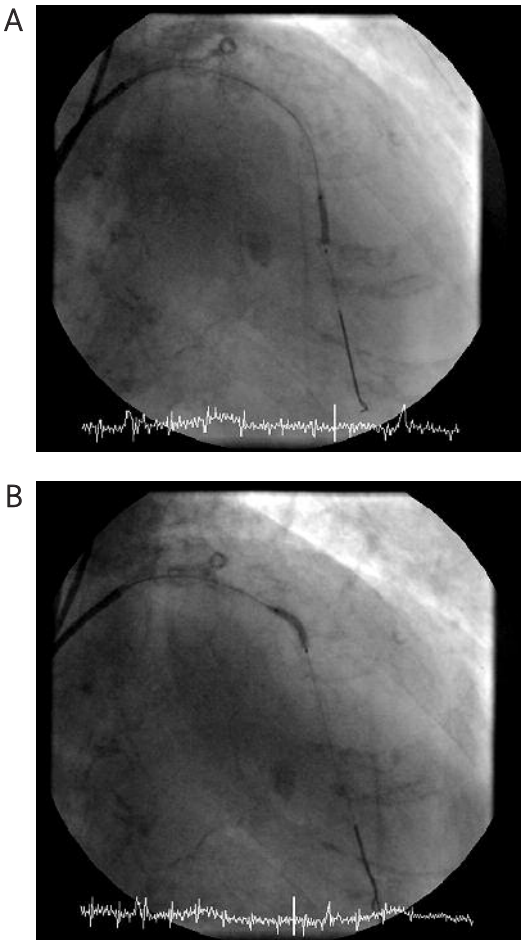

Fig. 4 A, B. Predilatation of left anterior descending artery

of the right femoral artery a guide catheter EBU 3.5 6F (Launcher, Medtronic) was inserted and 6500 IU of unfractionated heparin was administered (the patient was under chronic two-drug antithrombotic therapy with clopidogrel 75 mg/day and acetylsalicylic acid 75 mg/day).

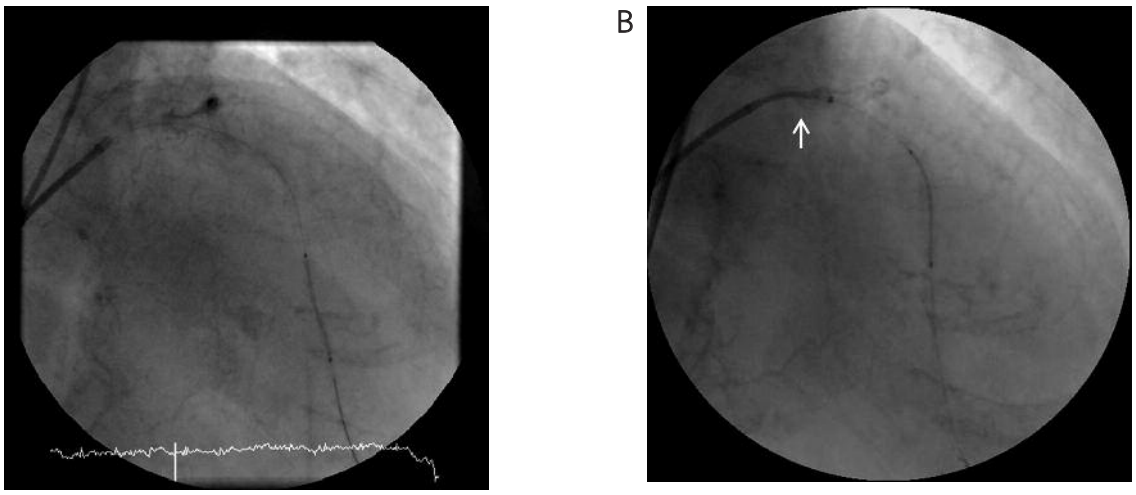

Fig. 5 A, B. Implantation of two stents using a Guideliner catheter (white arrow)

A rotablation guidewire was inserted into the LAD (Rotawire Floppy, Boston Scientific). In the next stage of the procedure rotational atherectomy on the whole length of the calcified stenosis was performed by means of a rotablator with a calibre 1.25 mm drill (Figure 3). Subsequently a predilatation was performed with a 2.5/33 mm high-pressure balloon catheter using maximum pressures of 12 atm (Trec NC, Abbott Vascular) (Figures 4 A, B). Then elective implantation of two everolimus-eluting stents was carried out distally 2.75/33 mm and proximally 3.0/38 mm in an overlapping manner (XIENCE Pro LL, Abbott Vascular). Due to the difficulty of transporting the stents to the stenosed area the buddy wire technique was initially employed. Because this technique turned out to be ineffective in transporting the stents, a catheter deeply intubating the coronary artery up to the stenosed area was used instead (GuideLiner, Vascular Solutions) (Figures 5 A, B). The desired result was achieved (Figure 6). The right femoral artery was closed with a compression dressing.

After the procedure the patient had no complications during the remaining time in hospital. He did not report any chest pain. However, laboratory tests revealed a slight increase in the cardiac enzyme values (troponin – 1.41 ng/ml), which did not meet the criteria for type 4a myocardial infarction. Pharmacotherapy prescribed included clopidogrel, acetylsalicylic acid, carvedilol, atorvastatin, ramipril, furosemide and pantoprazole.

On the second day after the procedure the patient was discharged from hospital and allowed to go home. Upon discharge the following medication was prescribed: clopidogrel 75 mg/day (for 12 months), acetylsalicylic acid 75 mg/day, carvedilol 2 × 3.125 mg/day, atorvastatin 20 mg/day, ramipril 1.25 mg/day, furosemide 40 mg/day and pantoprazole 20 mg/day (while taking clopidogrel). In addition, it was recommended that the patient's clinical condition should be reassessed in 3 months' time and the indications for implantation of a cardioverter-defibrillator should be considered.

Fig. 6. Coronarography of left coronary artery – final effect of PCI

Discussion

Patients with end-stage renal failure suffer from ischaemic heart disease several dozen times more frequently than the general population. Coronary artery lesions in patients with renal failure, especially those subjected to dialysis, are more extensive, diffused and calcified [1–3].

Revascularisation treatment, including both coronary artery bypass graft (CABG) and percutaneous coronary angioplasty, improves the prognosis for patients with chronic renal disease. Clinical studies on dialysed patients subjected to CABG demonstrated the disappearance of angina pain and a considerable improvement of life comfort as well as significant prolongation of survival [4, 5]. Percutaneous coronary interventions are equally effective in reduction of the death rate among dialysed patients. While percutaneous treatment involves the need for more frequent repeated revascularisation interventions due to the reoccurrence of stenosis and the progression of the disease in the long-term

perspective, it is associated with a significantly smaller risk of intervention-related death than CABG [6, 7].

According to the current recommendations of the European Society of Cardiology (ESC) the decision concerning revascularisation treatment in patients with chronic renal disease should be made by the Heart Team, i.e. a group consisting of an interventional cardiologist, a cardiac surgeon, a general cardiologist and a nephrologist. It is also recommended that the progression stage of coronary artery disease should be assessed using the Syntax score and the risk of death associated with cardiosurgical intervention should be evaluated by means of the EuroScore models [8].

Over the last few years significant progress in percutaneous treatment techniques has taken place. Currently stents that release medication are in common use, which has considerably reduced the risk of stenosis reoccurrence. Apart from that, atherosclerotic plaque modification techniques have been introduced, which have made it possible to implant stents in more complex and more heavily calcified stenosed areas in coronary arteries, which are typically found in dialysed patients. ESC recommendations include only the use of rotational atherectomy in order to prepare lesions containing heavy calcifications and intensified fibrosis not possible to handle with a balloon or dilate sufficiently before the planned stent treatment (class I, level of evidence C) [8].

Rotational atherectomy consists in reduction of the sclerotic plaque volume by grinding it by means of a rotablator (a diamond-particle-covered head spinning at 140–150 thousand revolutions per minute, driven by an air turbine). In the studies published to date which have employed rotational atherectomy the efficacy of PCI exceeds 95% [9, 10]. Successful angioplasty interventions using rotablation have also been observed in patients with compromised kidney function. The PCI register of the Mayo Clinic contains the assessment of PCI in over 5000 patients at different stages of chronic renal disease. Dialysed patients (n = 50) needed the revascularisation of the highest number of coronary arteries and in this group atherectomy procedures were used most often in order to modify the atherosclerotic plaque (4% directional, 16% rotational). The interventions were successful in 95% of cases, and this figure was comparable to that of the remaining patient groups [11]. Abdel-Wahab *et al.* evaluated the efficacy of PCI employing rotablation and the implantation of coated stents in a group of 205 patients, including 10% of this group suffering from chronic renal disease. Patients with compromised kidney function were not found to have worse outcomes of the procedures [12]. Aoki *et al*. compared the results of PCI with the use of rotational atherectomy to coronary artery bypass graft in dialysed patients. The coronary angioplasty efficacy reached 98%. The patients who were treated with CABG suffered from more surgery-related complications, while patients treated percutaneously required more frequent repeated revascularisation [13].

The case of our patient presents new possibilities of percutaneous treatment of coronary artery disease in patients in the final stage of renal disease with a history of ineffective classical coronary angioplasty and who have not been qualified for a coronary artery bypass graft. Rotational atherectomy allows for a safe modification of calcified atherosclerotic plaque and a successful percutaneous coronary intervention.

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