

A case of early development of giant coronary artery aneurysms after drug-eluting stents implantation: An unpredictable menace

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Abstract: Development of coronary artery aneurysm (CAA) after implantation of drug-eluting stent is occasionally observed. We present a case of a 67-year-old man who underwent everolimus-eluting stent (EES) implantation in right coronary artery (RCA) for inferior wall myocardial infarction, and thereafter, giant CAAs were developed in the vessel of stent deployment, within 2 months. However, the patient was managed with coronary artery bypass grafting (CABG). On follow-up, the patient's condition was stable. To the best of our knowledge, we report the first case of occurrence of EES-associated giant CAAs in RCA subsequently treated with CABG.

Keywords: drug-eluting stent, coronary artery bypass grafting, coronary aneurysm, coronary atherectomy, percutaneous coronary intervention

Introduction

Coronary artery aneurysm (CAA) is a vessel dilatation limited to a localized segment, which exceeds by 50% of the normal vessel diameter [1]. Generally, the CAAs larger than 20 mm of diameter are considered as giant CAAs [2, 3]. On the other hand, American Heart Association statement classifies giant aneurysms as those with diameter greater than 8 mm [4]. By and large, the occurrence of CAA detected with coronary angiography (CAG) and computed tomography is 0.3%–5.3% and with autopsy is 1.4% [5]. But in India, the prevalence of CAA was found to be only 0.7% in a series of 3,200 coronary angiograms [6].

Atherosclerosis has been the most common cause for development of CAA. Other causes include Kawasaki disease, polyarteritis nodosa, systemic lupus erythematosus, infection, traumatic injury, dissection, subacute bacterial endocarditis, rheumatic fever, and congenital malformation [1, 7]. Recently, angioplasty, atherectomy, and stenting are also found to be causes for the development of CAAs [8].

The CAAs usually remain asymptomatic, but sometimes they present with angina pectoris, sudden death, fistula formation, pericardial tamponade, or congestive heart failure. But it has been difficult to detect whether these are the signs of CAA or the underlying stenosis, thrombosis, or myocardial infarction [8, 9]. If the above signs remained undetected or untreated, these may lead to thrombus formation, embolization, fistula formation, and rupture, which ultimately results in death [8]. Moreover, the optimal therapy for patients with CAAs remains unclear. Here, we present a case of development of giant CAAs within 2 months after implantation of drug-eluting stents (DESs) in right coronary artery (RCA). However, the patient was managed with coronary artery bypass grafting (CABG) and his condition has been stable on further follow-up.

Case Presentation

A hypertensive, diabetic, 67-year-old man was admitted to an outside hospital for the treatment of inferior wall

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Fig. 1. Angiography showing 80% stenosis of proximal right coronary artery and total occlusion in distal right coronary artery

myocardial infarction. Angiography, in the same hospital, demonstrated 80% stenosis of calcified proximal RCA, total occlusion in distal RCA (*Fig. 1*), 30% stenosis in left main coronary artery, and 50% in mid left anterior descending artery (LAD) with a small non-dominant left circumflex artery. At that time, DES implantation in RCA was attempted. The RCA was crossed with a BMW wire and predilated with 1.5×10 mm and later with 2×10 mm balloons at 16 atm for 20 s. But it was not successful as no balloon could be negotiated beyond the lesion in proximal RCA after successful wire crossing. Thereafter, patient was referred to our hospital for further management.

After analyzing his CAG records, due to significant calcification in proximal RCA, rotablation was performed with a 1.25-mm burr at 165,000 rpm. Then, distal lesion was stented with 2.5×20 mm PROMUS Element (Boston Scientific, Marlborough, MA), and everolimus-eluting stent (EES) and proximal lesion were stented with 2.75×20 mm PROMUS Element stent (*Fig. 2*). This procedure was successful with thrombolysis in myocardial infarction (TIMI) III flow, and there was no visible dissection or residual lesion. Further follow-up up to 2 months was unremarkable.

After 2 months, the patient complained of chest pain and was admitted with non-ST-elevation myocardial infarction and moderate left ventricular dysfunction. A repeat angiogram showed giant RCA aneurysms besides restenosis, along with progression of left main disease. Two aneurysms were detected: one in proximal RCA (15×25 mm) and other in acute marginal artery (10×30 mm) (*Fig. 3*). Taking into account the patient's

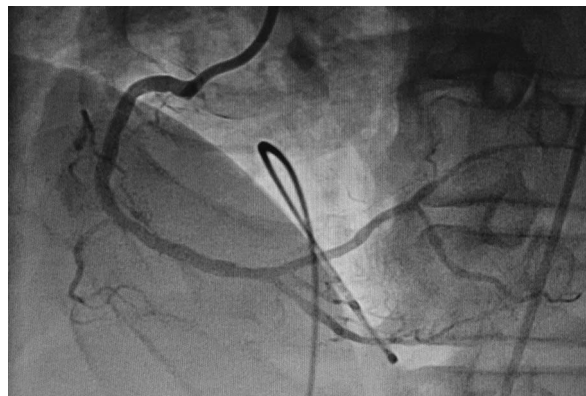


Fig. 2. Postangioplasty showing deployment of stent with TIMI III flow

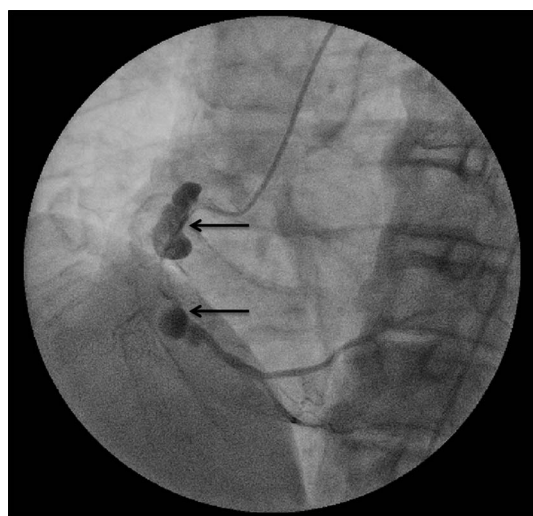


Fig. 3. Left anterior oblique coronary angiographic view showing aneurysms of the right coronary artery in the proximal portion and in acute marginal artery (black arrows)

condition and the size of the aneurysms, off-pump coronary artery bypass surgery (CABG) was planned (*Fig. 4*). Left internal mammary artery (LIMA) graft to LAD and saphenous vein graft (SVG) to posterior descending artery (PDA) were carried out. RCA ligation was carried out at the ostio-proximal end and the distal end to seal off the blood flow to the aneurysms.

The patient's condition was stable at the end of the operation. Post CABG, patient was discharged on dual antiplatelet therapy and statin. At further follow-up, patient was doing well and asymptomatic.

Discussion

The prevalence of CAAs after DES implantation has been reported to be 0.2%–10.5% [10], detected between 3 days and 4 years after implantation [11]. We report a case of

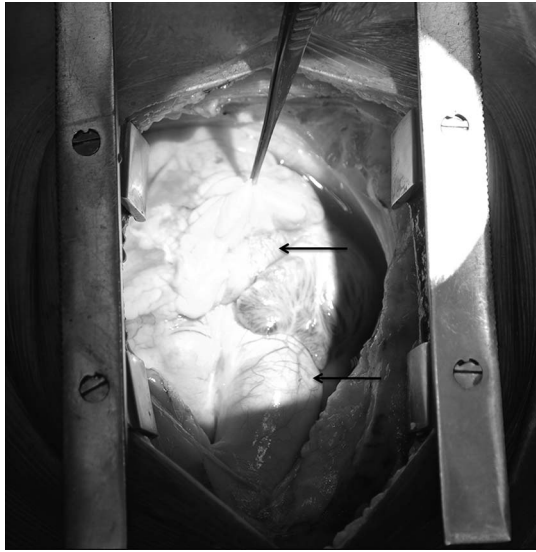


Fig. 4. Coronary aneurysms during surgery; right coronary artery aneurysms are shown (black arrows)

detection of giant CAAs after 2 months of implantation of EESs to RCA in a patient with diabetes. The patient presented with chest pain, and on performing angiography, two significant aneurysms were detected in RCA. Literature suggests that RCA has been affected time and again when compared with the left coronaries [7]. The probable reason behind such increased incidences might be the peculiar anatomy of RCA.

The mechanism behind development of aneurysm after DES implantation is postulated as a hypersensitivity reaction and vasculitis that is elicited by the polymer after the drug has been completely eluted from it [9, 12]. In the present case, PROMUS Element, EESs were implanted, which has drug elution time window of 90 days [13]. However, the aneurysms developed within 2 months of percutaneous coronary intervention, which rules out the involvement of aforementioned factor in instigating the aneurysm. Some studies suggest that dilatation of wall of the artery during balloon inflation, mechanical damage to the arterial wall during stent placement, or ablative techniques utilized for stent implantation have supposedly been associated with aneurysm formation [9, 10]. In our case, injury or microdissection in the arterial wall, due to either rotablation or stent itself was the plausible cause for the emergence of aneurysm.

In our case, aneurysms occurred along with restenosis, and there was a progression of lesion in the left main disease; therefore, the patient was advised to undergo bypass surgery. The PDA and LAD were grafted with SVG and LIMA, respectively. Previously, various cases have been reported in which implantation of sirolimus-eluting stents or paclitaxel-eluting stent had led to development of aneurysm and were consequently managed with CABG to the left coronary branches with or without aneurysm repair [14–20]. By and large, aneurysms in

RCA following stent implantation have been treated with either stents or medically [21–23]. Cases involving development of aneurysm due to EESs are uncommon. Zbinden et al. [24] were the first to report the incidence of aneurysm within 3 months after the implantation of EESs in obtuse marginal branches (OM) and distal posterolateral artery. The aneurysm was managed by redilating the OM stent. Recently, Kadakia et al. [25] have reported a case of aneurysm development within 7 days of EESs implantation to LAD and its branches. Aneurysm was formed at distal LAD, so CABG was performed. To the best of our knowledge, we report the first case of aneurysm due to EESs implantation in RCA and subsequently treated with CABG. The patient was asymptomatic at follow-up.

Till date, optimal therapy for CAAs' treatment has been disputable because of the availability of scant data on management with coil embolization, stenting, and surgery. Moreover, there have been concerns relating to the aneurysm location and clinical state of the patient [26]. Thus, when deciding the management of CAAs, treatment must be based on patient's condition, specifically size and site of aneurysm, patency of the vessel, and comorbidities must be emphasized.

Conclusion

We report a case of development of giant coronary aneurysm following DES implantation that was successfully managed with CABG and ligation of the culprit vessel. As treatment strategies are not clearly defined, the management of CAAs associated with DES should be individualized.

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