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Coronary heart disease

Giant coronary artery aneurysm of the left main treated with a covered stent: a case report

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Background Coronary artery aneurysms (CAAs) of the left main represent a small subset of coronary artery disease and are associated with cardiovascular death. Because of its rare entity, large data are lacking and therefore treatment guidelines are missing.

Case summary We describe a case of a 56-year-old female with a past medical history of spontaneous dissection of the distal descending left artery (LAD) 6 years before. She presented to our hospital with a non-ST elevation myocardial infarction and a coronary angiogram showed a giant saccular aneurysm of the shaft of the left main coronary artery (LMCA). Given the risk of rupture and distal embolization, the heart team decided to go for a percutaneous approach. Based on a pre-interventional 3D reconstructed CT scan and guided by intravascular ultrasound, the aneurysm was successfully excluded with a 5 mm papyrus-covered stent. At 3-month and 1-year follow-up, the patient is still asymptomatic and repeat angiographies showed full exclusion of the aneurysm and the absence of restenosis in the covered stent.

Discussion We describe the successful percutaneous IVUS-guided treatment of a giant LMCA shaft coronary aneurysm with a papyrus-covered stent with an excellent 1-year angiographic follow-up showing no residual filling of the aneurysm and no stent restenosis.

Keywords Coronary artery aneurysm • Percutaneous coronary intervention • Covered stent • Left main coronary artery • Case report

ESC Curriculum 3.1 Coronary artery disease • 3.4 Coronary angiography • 3.2 Acute coronary syndrome

Learning points

- The rarity of CAA of the left main coronary artery, lacking data, and treatment guidelines make multidisciplinary decision mandatory in these cases.
- In patients with fibromuscular dysplasia and documented coronary aneurysms, angiographic follow-up could be considered to observe growth of aneurysms.
- Additional imaging techniques such as a CT scan or IVUS can give a better understanding of the size and location of the aneurysm, especially when a percutaneous coronary intervention (PCI) is considered to size the stent.
- Even when an aneurysm is not fully covered after PCI, the aneurysm can become clotted and the gap can be closed spontaneously, so no coiling is necessary.
- Long-term follow-up of a covered stent showed no occurrence of MACE.

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Introduction

A coronary artery aneurysm (CAA) was first described by Bougon in 1812 who found a ruptured right coronary artery post-mortem in a patient who had suffered sudden death. He described it as 'into which the barrel of a goose quill could be easily introduced'.[1] A CAA is defined as a localized coronary dilatation ≥1.5 times the diameter of the normal adjacent segment.[2] The reported incidence rate of CAAs ranges from 0.3% to 5.3%, with pooled data showing a mean incidence rate of 1.65%. However, excluding coronary artery ectasia, true incidence of CAAs is <1%.[3,4] Most CAAs are due to atherosclerosis. Other possible causes include certain infectious, vasculitic and connective tissue diseases, and trauma.[5,6] Complications of aneurysms include thrombosis, embolization, and ischaemia, whereas compression of adjacent structures or rupture of the aneurysm appears rarely.[7,8] Management options include surgical ligation of the aneurysm with distal bypass surgery, stenting, or medical treatment with anticoagulation.[9] There are no guidelines or treatment protocols on this topic. We report the case of a successful percutaneous treatment of a giant left main coronary artery (LMCA) aneurysm with a covered stent.

Timeline

– 6 years	Admission with a myocardial infarction because of spontaneous coronary artery dissection of the LAD after balloon inflation.
Day 0	Admission with NSTEMI
Day 1	Coronary angiography showed no coronary stenosis or SCAD, but a large saccular aneurysm of the shaft of the left main coronary artery (LMCA) was visible.
Day 21	PCI with stenting of LMCA with coverage of an aneurysm was performed with a papyrus-covered stent (5.0 × 15 mm).
3 months	Coronary angiography showed good results of previous stenting with full closure of an aneurysm in LMCA.
1 year	Coronary angiography showed persistent good results without in-stent restenosis and full closure of the aneurysm in LMCA

Case report

A 56-year-old female patient with NSTEMI (peak high-sensitive troponin 33 ng/L) was referred to our hospital for coronary angiography (CA). Her medical history consisted of hypertension and hypercholesterolaemia, and she had a spontaneous coronary artery dissection (SCAD) of the distal descending left artery (LAD) 6 years before presentation. At that time, balloon angioplasty was used to treat the SCAD with good results, and there was already a slight ectasia of the left main visible (*Figure 1A*). Electrocardiogram during the current presentation showed dynamic inverted T waves in the septal leads and flattened T waves in the anterolateral leads which normalized during hospitalization. Echocardiography was without regional wall motion abnormalities. A CA was performed and unveiled, besides a complete recovery of the previous dissected distal LAD, a giant saccular aneurysm of the LMCA shaft not extending beyond the distal bifurcation. No coronary artery stenoses or dissection were present. (*Figure 1B and C*) The aneurysm and embolism accompanied by it were the presumed cause of the NSTEMI. An additional CT coronary angiography was performed to better define the anatomy prior to intervention (*Figure 1D and E*). The length of the aneurysm was 15 mm, and the maximal diameter was 8.5 mm. Based on these findings, the revascularization strategy was discussed within the multidisciplinary team. Given the rapid growth of the aneurysm over 6 years, the risk of thrombosis and the rupture of the CAA were deemed too large to remain conservative. Because of the acceptable proximal and distal landing zone, a percutaneous coronary intervention (PCI) was considered safer than a surgical approach. Preceding the PCI intravascular ultrasound was performed which confirmed no involvement of the aneurysm beyond the bifurcation of LAD and LCx. IVUS detected no (residual) thrombus. The administration of dual antiplatelet therapy and 3 weeks interval between the diagnostic CA- and IVUS-guided PCI might explain the absence of residual thrombus on IVUS. Subsequently, after placing a safety balloon in the LCX, a 5 × 15 mm Papyrus-covered stent was deployed from the ostial LMCA to just proximal of the LMCA bifurcation thereby covering the giant aneurysm while not compromising flow to the LCX. The implantation of the stent occurred in the caudal right oblique view with 16 atmospheres. After post-dilatation with a 5.5 mm NC balloon, angiography and IVUS demonstrated incomplete coverage of the distal part aneurysm at the level of the bifurcation, with limited retrograde filling of the aneurysm by a small gap distal from the stent close to the bifurcation (*Figure 2*). Besides secondary prevention, dual antiplatelet therapy was prescribed for the duration of 1 year. No anticoagulation was added as antiplatelet agents were presumed of more importance to prevent stent thrombosis and anticoagulants might delay the sealing of the aneurysm. At 3- and 12-month post-procedure, CA showed an excellent result of the PCI without a residual neck or retrograde filling of the aneurysm and without obvious restenosis (*Figure 3*). Consequently, additional coiling was not necessary. The history of SCAD and CAA suggested a common underlying cause. MRI of the renal and brain arteries confirmed the diagnosis of fibromuscular dysplasia.

Discussion

We describe the successful percutaneous IVUS-guided treatment of a giant left main coronary aneurysm with a papyrus-covered stent with an excellent 1-year angiographic follow-up showing no residual filling of the aneurysm and no in-stent restenosis. While the indication for treatment is controversial and based on expert opinion, the risk of thrombosis, further distal embolization, and rupture were deemed too large to remain conservative considering the rapid growth of the aneurysm over 6 years and current presentation with NSTEMI suggesting distal embolization. The anatomy of this CAA allowed a good deposition of a covered stent and if needed we preserved the option of bypass surgery. In our opinion, percutaneous treatment should be the first choice in the majority of cases if feasible. In a case with an extension of the aneurysm beyond the distal left main bifurcation, we previously performed a successful treatment with stent-assisted coiling using a two-stent culotte strategy and subsequent coiling of the aneurysm through a jailed microcatheter.[10] If the aneurysm does not extend beyond the bifurcation, covered stenting is our preferred strategy.

There are several unique and relevant aspects of this exciting case. First, it is important to highlight the importance of multidisciplinary decision-making in similar cases. Since these cases are extremely rare, there is a substantial lack of large-scale data or randomized

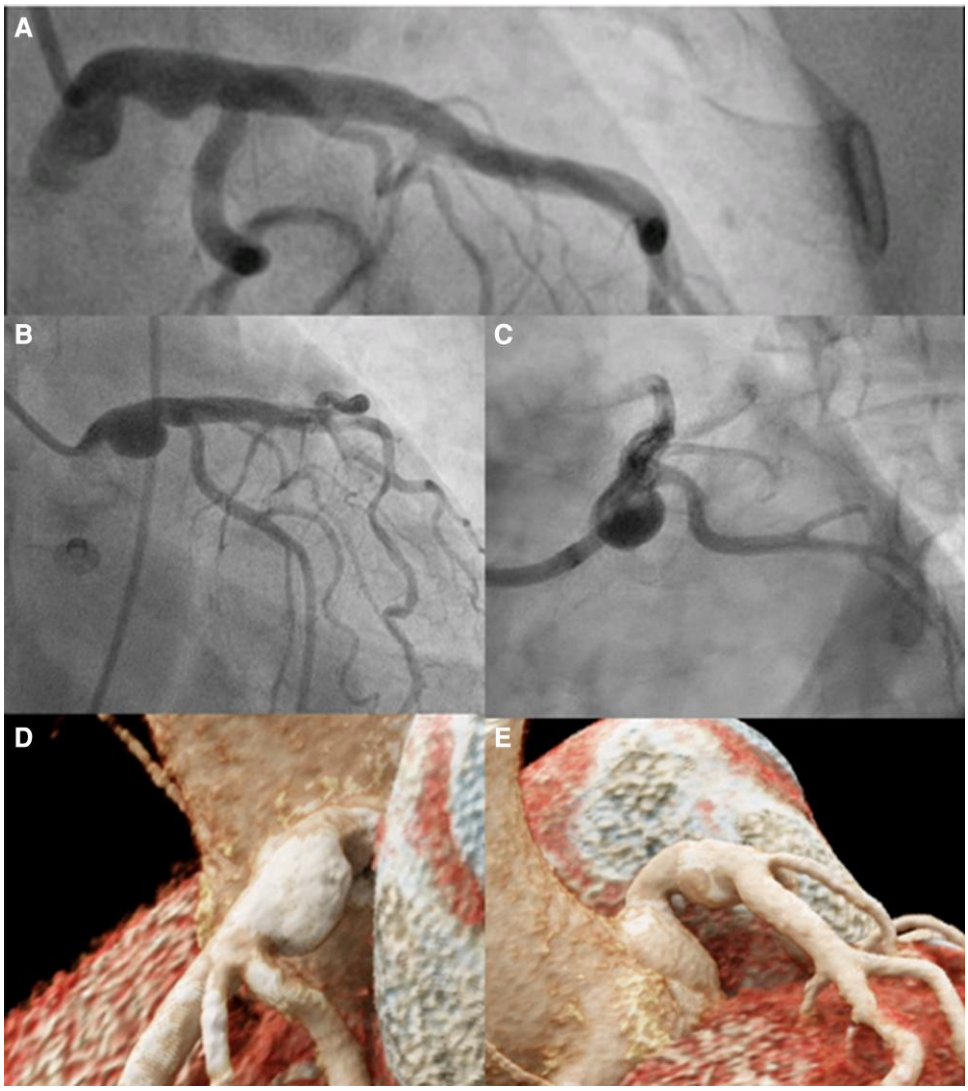

Figure 1 (*A*) Ectasia of the left main coronary artery 6 years before. (*B* + *C*) Development to the left main coronary artery aneurysm, respectively, in right and left caudal view. (*D* + *E*) CT reconstruction of left main coronary artery.

trials. Recommendations for the treatment of CAA are based on small case series or anecdotal evidence. Treatment strategies (medical therapy, PCI, or surgery) should be based on clinical presentation, extension of aneurysm, location and morphology of the aneurysm, side branch involvement, tortuosity, calcification, comorbidity, and patients' preference. As there is no standard guideline or protocol to treat the CAA of the LMCA, multidisciplinary discussion is mandatory.

Second, we showed for the first-time spectacular growth of small coronary ectasia during 6 years of angiographic follow-up. Therefore, cardiologists should consider regular angiographic or CT graphic follow-up of coronary ectasia, especially in patients with underlying diseases such as fibromuscular dysplasia. Third, we used a pre-PCI coronary 3D reconstructed CT scan to allow optimal sizing of the papyrus-covered stent. Pre-procedural CT-based sizing showed perfect correlation with per-procedural IVUS. This is paramount for procedural success since 5 mm covered stents are not routinely on the shelf in most cathlabs and patients with LMCA diameters beyond 6 mm are not eligible for covered stenting. Fourth, we showed that it is safe to treat a coronary aneurysm with a covered stent even when located very close to the bifurcation. We would recommend always using a jailed safety balloon in the LCX to leave all bail-out options open when treating aneurysms close to the bifurcation. Fifth, we showed that limited retrograde filling by a small gap at the distal stent edge spontaneously disappeared at 3-month follow-up. Therefore, we would recommend not to be overly aggressive with additional coiling during the index procedure. Finally, we angiographically documented the absence of restenosis in a large covered stent at 1 year of follow-up. Restenosis and in-stent thrombosis are feared complications of covered stents. The diameter of the CAA plays an important role with regard to these post-procedure complications. Diameters <3 mm are at higher risk of restenosis and those >4.5 mm have a low risk of restenosis.[11] Briguori *et al.*[12] evaluated eight PTFE-covered stents implanted to treat CAAs in seven patients. Angiographic follow-up at 10 ± 6 months in all patients revealed restenosis in only 1 patient (14%). Nevertheless, we would recommend performing long-term angiographic follow-up after covered stenting of the left main since gradual restenosis would mandate further surgical or percutaneous treatment.

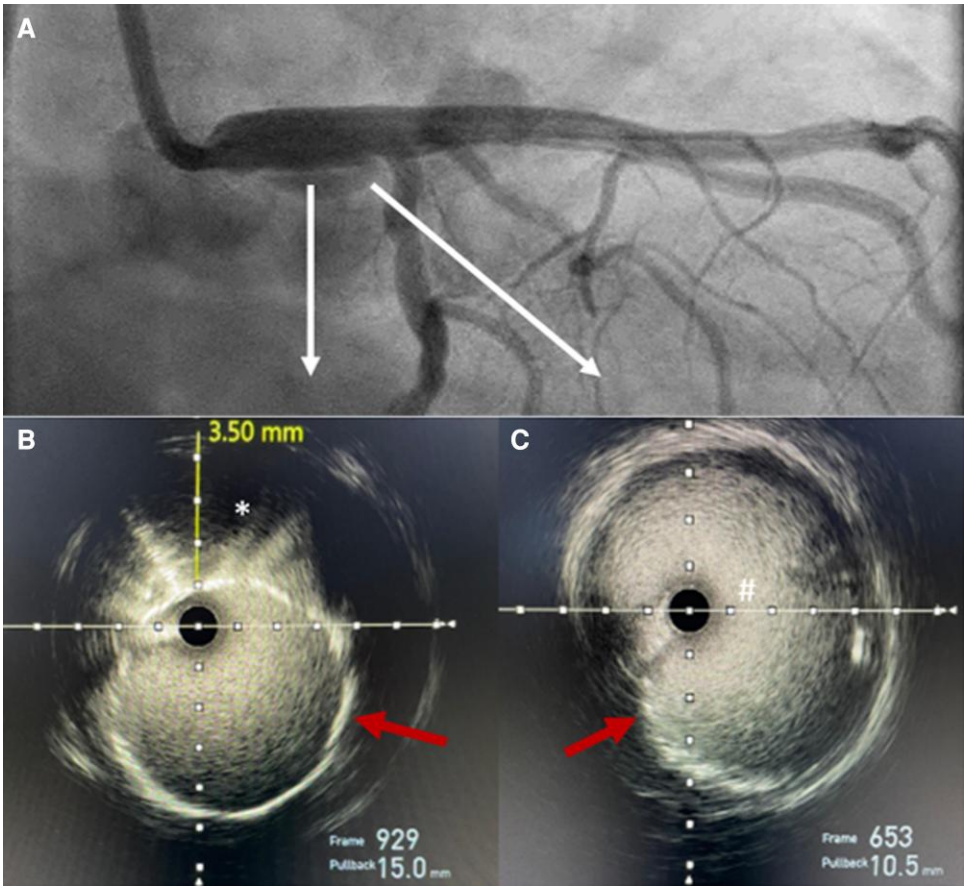

Figure 2 (*A*) Immediate angiographic results following covered coronary stent placement with remaining dye in aneurysm in right caudal view. (*B* + *C*) Intravascular ultrasound images showing the covered stent (arrow) in the aneurysm (*) and the edge of the stent with a remaining neck to the aneurysmal cavity (#).

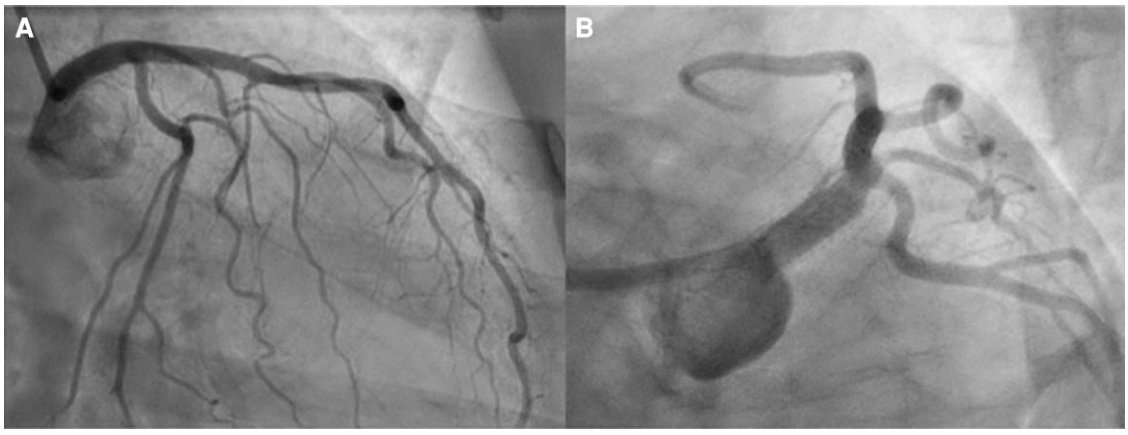

Figure 3 Angiographic images of the left main coronary artery at 1 year follow-up showing an excellent result of the percutaneous procedure without a residual neck nor retrograde filling of the aneurysm. (*A*) Right caudal view. (*B*) Left caudal view.

Conclusion

We describe the successful percutaneous IVUS-guided treatment of a giant left main shaft coronary aneurysm with a papyrus-covered stent with an excellent 1-year angiographic follow-up showing no residual filling of the aneurysm and no stent restenosis.

Lead author biography

Wouter Holvoet is an interventional cardiologist in AZ Groeninge hospital, Belgium. He graduated as Master in Medicine at the University of Leuven in 2011. Whereafter he completed his training in cardiology (2018) and intensive care (2020) in Maastricht University Medical Center, The Netherlands. After he served a fellowship in interventional cardiology in Ziekenhuis Oost Limburg (2021), he currently works in Kortrijk, AZ Groeninge hospital. There Wouter focusses on interventional and sports cardiology.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports*.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: The patient voluntarily agreed to participate in this case report and signed patient's consent to publication of information in accordance with COPE guidelines.

Conflict of interest: None declared

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