

Exclusion of a Giant Coronary Artery Aneurysm With Covered Stents Using a Long Drug-Eluting Stent Scaffold

Clinical Medicine Insights: Case Reports
Volume 12: 1–3
© The Author(s) 2019
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1179547619828689



Ryan Cotter^{1,2} , Mori Krantz^{1,2}, Shea Hogan^{1,2} and Matthew Holland^{1,2}

¹Division of Cardiology, School of Medicine, University of Colorado, Aurora, CO, USA. ²Division of Cardiology, Denver Health Medical Center, Denver CO, USA.

ABSTRACT: Coronary artery aneurysms (CAA) are a rare cause of acute coronary syndrome and there is little consensus as to the optimal treatment. Based on case series as well as expert opinion, surgery has been suggested as the optimal treatment for a giant CAA. Here, we present the case of a patient with recurrent myocardial infarction and severe angina due to a giant CAA, who was deemed a poor surgical candidate due to his multiple medical comorbidities. Given his intractable anginal symptoms despite medical therapy, he chose to pursue percutaneous intervention. However, the aneurysm was larger than available covered coronary stents and the patient had significant atherosclerotic disease proximal and distal to the aneurysm itself. Our approach used a long drug-eluting stent as a scaffold to overlap covered coronary stents to successfully exclude the aneurysm. The patient's angina resolved and had no complications or readmissions after nearly 1 year of follow-up.

KEYWORDS: coronary atherosclerosis, acute coronary syndrome, angina

RECEIVED: October 23, 2018. **ACCEPTED:** January 10, 2019.

TYPE: Case report

FUNDING: The author(s) received no financial support for the research, authorship, and/or publication of this article.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CORRESPONDING AUTHOR: Ryan Cotter, Division of Cardiology, School of Medicine, University of Colorado, Mail Stop B130, Academic Office 1, Aurora, CO 80045, USA. Email: ryan.cotter@ucdenver.edu

Introduction

Coronary artery aneurysms (CAA) are a rare cause of acute coronary syndrome (ACS) with a distinct mechanism of myocardial infarction; the low flow state within the aneurysm sac is prone to thrombus formation and subsequent distal embolization. In addition to standard dual antiplatelet therapy for ACS, these patients often also require anticoagulation therapy.¹ Beyond medical therapy, symptomatic CAA patients have often required a variety of novel revascularization approaches, including covered stents, surgical approaches, and coil embolization.^{2–4} However, there are no current guidelines on optimal revascularization approaches. A review by Boyer et al¹ proposes an algorithmic approach taking into account both clinical and angiographic factors in determining treatment strategy, though this is predominantly based on case series and expert opinion.

A giant CAA can present a unique clinical challenge, and surgery has been suggested as the preferred treatment.² This is likely due to the complexity of endovascular intervention in a giant CAA, as well as surgical success in excising giant coronary aneurysm sacs. There is no universally accepted definition of a giant CAA; however, one of the largest CAA studies defined giant CAA as an aneurysm size of greater than 4 times the reference vessel size.⁵ Similarly, there has been no large study examining the prevalence of giant CAA, though available data suggest that approximately 0.2% of patients undergoing coronary angiography may have a giant CAA.⁶ Given uncertainty regarding optimal endovascular approaches, we describe a case of a patient with a giant CAA, which was the source of embolic myocardial infarction and intractable angina in a high-risk patient who was not a surgical candidate. To our knowledge, utilization of a drug-eluting stent (DES) as a scaffold to

facilitate exclusion of a giant CAA due to coronary artery disease has not been reported.

Case

A 58-year-old male presented to the emergency room with resting chest discomfort and non-ST-elevation myocardial infarction (NSTEMI). His past medical history was notable for cirrhosis, coronary artery disease with an ST-elevation myocardial infarction (STEMI) 10 years prior to presentation due to occlusion of the left anterior descending (LAD) artery, and resultant ischemic cardiomyopathy with a left ventricular ejection fraction (LVEF) of 23% with antero-apical akinesis. Urgent coronary angiography revealed a chronic total occlusion of the LAD, as well as a giant right CAA (Figure 1A). In addition, there was a high-grade stenosis just proximal to the aneurysm itself. He was managed medically with therapeutic anticoagulation and antiplatelet therapy with aspirin and clopidogrel. He was evaluated by cardiothoracic surgery to excise or bypass the giant CAA but was not deemed to be an acceptable surgical candidate given his history of cirrhosis and severely reduced LVEF.

As an outpatient, he continued to experience angina with minimal exertion (Canadian Cardiovascular Society (CCS) Class III-IV) despite being maintained on anticoagulation, dual antiplatelet, and antianginal medication. He was referred for percutaneous intervention given medically refractory symptoms. The interventional approach was limited, given that covered stents are not FDA approved for the exclusion of CAA. We therefore obtained approval from the Colorado Multiple Institutional Review Board, as well as from Abbott Vascular (Abbott Park, IL, USA) – the manufacturer of the



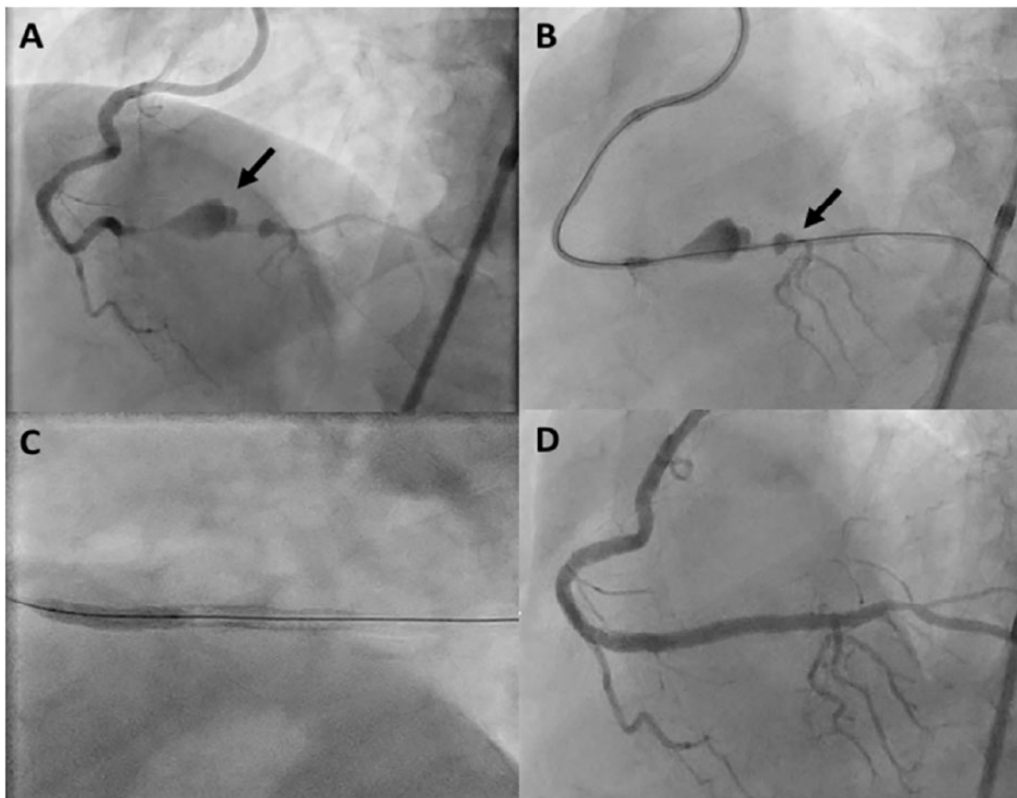


Figure 1. (A) There is significant tortuosity of the right coronary artery (RCA) as well as a large aneurysm which partially fills with contrast (arrow). A large calcified rim can also be seen. (B) Positioning the drug-eluting stent. The distal marker can be seen just proximal to a large branch (arrow). (C) High-pressure postdilatation of the covered stents to ensure apposition to the DES scaffold (3.5 mm non-compliant balloon at 18 atm). (D) Final angiography. The CAA has been successfully excluded with no residual flow into the aneurysm sac. CAA indicates coronary artery aneurysms; DES, drug-eluting stent.

GRAFTMASTER covered coronary stent – to pursue endovascular exclusion of his giant CAA.

Given the elective nature of the case, we chose to use the most supportive system available to us due to the significant tortuosity, distal location of the aneurysm, and prior experience delivering inflexible covered stents. This included a long 45-cm 8-Fr femoral sheath, an 8-Fr AL1 guide catheter, and an 8-Fr GuideLiner catheter (Vascular Solutions, Inc., Minneapolis, MN, USA). However, the patient underwent a cardiac magnetic resonance imaging (MRI), which revealed that the neck of the aneurysm was longer than available covered stent lengths: the lesion was >30 mm, but the covered stents were available in 16, 19, and 26 mm. Therefore, overlapping covered stents were required. This was confirmed by intravascular ultrasound (IVUS), used to precisely measure the aneurysm length and to localize less diseased segments for stent deployment. Due to the aneurysm length and presence of severe atherosclerotic disease, we elected to deploy a single $3.0\text{ mm} \times 38\text{ mm}$ DES to span the neck of the aneurysm and cover the proximal and distal plaque (Figure 1B). This DES was then used as a “scaffold” to deploy overlapping covered coronary stents ($2.8\text{ mm} \times 19\text{ mm}$ distal, $2.8\text{ mm} \times 26\text{ mm}$ proximal). The covered stents were postdilated with a 3.5-mm non-compliant balloon at 18 atm to ensure good apposition to the DES scaffold, which was confirmed by repeat IVUS (Figure 1C). The aneurysm was

successfully excluded with no residual contrast flow into the aneurysm sac, and the proximal and distal coronary lesions were successfully treated with no residual stenosis (Figure 1D). However, a dissection was noted proximally, which required placement of a second DES without further complications. After this procedure, the patient’s symptoms subsided. Approximately 10 months later, the patient presented to clinic with a complaint of dyspnea; he had also run out of his clopidogrel and stopped taking his warfarin. Given his prior history and concern for possible covered stent thrombosis, coronary angiography was performed. The covered stents remained widely patent with the aneurysm still excluded and the patient was resumed on medical therapy (Figure 2).

Discussion

Coronary artery aneurysms larger than available covered stents can be successfully excluded using a DES scaffold. This method also has the advantage of optimally addressing the underlying atherosclerotic coronary disease, because covered coronary stents are prone to edge restenosis when deployed over diseased segments. We could have attempted to overlap covered stents without the DES scaffold but were concerned that deploying one end of the covered stent in an unsupported manner would put the patient at high risk for a stent-related mechanical complication. For instance, poor apposition in the overlapped segment



Figure 2. The previously placed covered stents were widely patent on this 10-month follow-up angiogram performed due to increased dyspnea.

could increase the risk of stent thrombosis or lead to incomplete exclusion of the aneurysm. In addition, eventual dehiscence of the overlap could occur due to continued cardiac motion without a reinforcing scaffold. Others have suggested the use of longer peripheral covered stents for exclusion of giant CAA, but this was not an option in the current case because these peripheral stents were too large of a diameter for the patient's native right coronary artery.⁴ Most importantly, the patient has had a dramatic improvement in his functional status and no significant

complications. In conclusion, our technique of using a scaffold to overlap covered coronary stents to successfully exclude giant CAA should be considered a viable endovascular treatment option for patients who are not surgical candidates.

Author Contributions

RC wrote the manuscript with support from MK, SH, and MH. MH was the primary proceduralist for the case.

ORCID iD

Ryan Cotter  <https://orcid.org/0000-0002-6095-9008>

REFERENCES

1. Boyer N, Gupta R, Schevchuck A, et al. Coronary artery aneurysms in acute coronary syndrome: case series, review, and proposed management strategy. *J Invasive Cardiol.* 2014;26:283–290.
2. Jha NK, Ouda HZ, Khan JA, Eising GP, Augustin N. Giant right coronary artery aneurysm—case report and literature review. *J Cardiothorac Surg.* 2009;4:18. doi:10.1186/1749-8090-4-18.
3. Gasparini GL, Oreglia JA, Reimers B. Self-apposing stent-assisted coil embolization for the treatment of coronary artery aneurysm. *Catheter Cardiovasc Interv.* 2018;91:470–474. doi:10.1002/ccd.27345.
4. Kim TH, Marfatia R, Lee J, Azrin M. Giant coronary aneurysm management with Viabahn covered stent. *Cardiovasc Revasc Med.* 2017;18:56–59. doi:10.1016/j.carrev.2017.03.019.
5. Kato H, Sugimura T, Akagi T, et al. Long-term consequences of Kawasaki disease. A 10- to 21-year follow-up study of 594 patients. *Circulation.* 1996;94:1379–1385.
6. Alcock R, Naoum C, Ng AC. Giant right coronary aneurysm: a case of mistaken identity. *Eur Heart J.* 2011;32:2712. doi:10.1093/eurheartj/ehr146.