

# Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist



## PROGRAM SPOTLIGHT

### Building a VTE Center of Excellence at HCA Florida Memorial Hospital

An interview with Mohannad Bisharat, MD, FACC, Medical Director of Cardiac Coronary Interventions, Ashchi Heart & Vascular Center.

More than a decade ago, the United States Surgeon General instituted a nationwide “call to action”<sup>1</sup> to solve a serious and growing health problem in the U.S.: deep vein thrombosis and pulmonary embolism (PE). In the years since and with the magnitude of COVID-related thrombotic events, the impact of that call has been less than hoped for and the number of patients who suffer from venous thromboembolism (VTE) continues to increase.<sup>2,3</sup>

In the spring of 2021, the interventional cardiologists at HCA Florida Memorial Hospital decided to amplify their efforts to address VTE at their institution. Dr. Mohannad Bisharat describes how the VTE Center of Excellence program got its start, how patient pathways have changed, and the key elements needed for success.

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## PATIENT CARE

### Communication Coaching in Cardiology

CLD talks with Kathryn Pollak, PhD

Kathryn Pollak and colleagues recently published a two-arm randomized clinical trial in *JAMA Internal Medicine*<sup>1</sup> evaluating a communication coaching intervention in cardiologists. The trial was performed at outpatient cardiology clinics at an academic medical center and affiliated community clinics from February 2019 to March 2020. Participants included 40 cardiologists, 161 preintervention patients, and 240 postintervention patients. Half the participating cardiologists underwent three 1:1 communication coaching sessions. Two sessions included feedback on their audio-recorded encounters with patients. In the sessions, communication coaches taught 5 skills: (1) sitting down and making eye contact with everyone present, (2) asking open-ended questions, (3) reflective statements, (4) empathic statements, and (5) “What questions do you have?” Blinded coders evaluated recorded audio of physician-patient conversations and patients completed a survey after their visit.

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## CASE REPORT

### The Use of Renal Artery Stents in Aneurysmal Coronary Artery Disease

Jessica Pickard, BS, MS-IV; Adam Reitz, DO; John Phillips, MD

#### Abstract

Aneurysmal coronary artery disease (ACAD) is a condition in which the coronary arteries become widened and dilated. It is defined as arterial dilatation with a diameter 1.5 times greater than the adjacent normal coronary vessel.<sup>1</sup> The optimal approach to the management of acute coronary syndrome in the setting of ACAD is somewhat controversial and understudied. While optimal management includes percutaneous intervention and stent placement, the diameter of these vessels poses a challenge to appropriate percutaneous intervention and restoration of blood flow, causing many ACAD patients to receive second-line therapies including balloon angioplasty and mechanical thrombectomy. This case report aims to shed light on the potential utilization of renal artery stents within aneurysmal coronary vessels to provide patients with ACAD first-line intervention in the setting of acute coronary syndrome.

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# The Use of Renal Artery Stents in Aneurysmal Coronary Artery Disease

Jessica Pickard, BS, MS-IV; Adam Reitz, DO; John Phillips, MD

Primary percutaneous coronary intervention (PCI) is the gold-standard first-line therapy for the management of acute coronary syndrome.<sup>1</sup> PCI involves performing coronary angiography, identifying the location of occlusion or stenosis, measuring the lumen of this area using intravascular ultrasound, choosing an optimal stent size, and deploying the stent to restore flow. Optimal stent sizing is achieved when the stent meets the luminal wall without exceeding its boundaries which allows for endothelialization and prevention of stent migration and thrombosis.<sup>2</sup> Undersized stents pose an increased risk of restenosis and

thrombosis, making stent placement in patients with aneurysmal coronary artery disease (ACAD) particularly challenging. We describe a patient with ACAD in the setting of an acute ST-segment elevation myocardial infarction (STEMI), managed with the transcatheter placement of a renal artery stent within the distal right coronary artery (RCA).

## Case Presentation

A 39-year-old male with a past medical history of inferior MI, left popliteal thrombus, and hypertension was admitted to our institution due to chest pain of 8 hours duration in the setting of known

coronary artery disease. He presented from home via emergency medical services transport where he was given nitroglycerine and aspirin en route. The chest pain was described as diffuse pressure radiating across the anterior chest wall and down the upper extremities. His vital signs were significant for blood pressure of 201/147 mm Hg, pulse of 100 beats per minute, and respirations of 20 per minute. An electrocardiogram (ECG) revealed ST-segment elevations in leads II, III, and aVF with reciprocal depressions in leads I, aVL, and V2, consistent with an inferior MI. Laboratory tests showed markedly elevated troponin T and lactic acid. Physical exam was grossly normal with regular heart rhythm, no diaphoresis, shortness of breath, or dyspnea.

The patient had an extensive cardiovascular history including a previous popliteal artery embolism treated with embolectomy, inferior MI treated with thrombectomy, and several cardiac catheterizations that utilized balloon angioplasty to resolve arterial stenosis. His clinical history was also relevant for longstanding hypertension. Following his initial MI, it was recommended that he continue dual-antiplatelet therapy with aspirin and clopidogrel, as well as high-intensity statin therapy and lifelong anticoagulation in the setting of his extensive thrombotic history. Three months following PCI, he again presented with similar symptoms and was found to have an inferior MI with recurrent occlusion of the ectatic distal RCA involving bifurcation of the posterior descending artery (PDA). This was likely in the setting of clopidogrel noncompliance and hypercoagulability of unknown etiology.

Given the patient's history of recent MI and non-compliance with the recommended dual-antiplatelet therapy, recurrent thrombosis was the most likely diagnosis. In the setting of several arterial thrombotic events, it was essential to understand the origin of his hypercoagulable state and determine what additional factors were contributing to his tendency to produce thrombi. There was a concern for the presence of a coagulation disorder, either genetic or acquired, which warranted further investigation. The hypercoagulability work-up, including antiphospholipid A, cardiolipin antibodies, and lupus anticoagulant, was negative. The etiology of his hypercoagulable tendency remained unclear, and management was focused on the prevention of future clot formation and restoration of blood flow in vessels with known clot burden.

Upon admission, electrocardiogram (ECG) revealed sinus tachycardia with ST-elevations in the inferior leads with the presence of deep Q waves, suggesting an age-indeterminate MI. A left heart catheterization revealed thrombosis of the aneurysmal distal RCA with involvement of the bifurcation of the PDA. A transthoracic echocardiogram revealed left ventricular wall motion abnormality and severely hypokinetic inferior wall segments with moderately increased left ventricular wall



**Figure 1.** Cardiac catheterization revealed 100% occlusion of the distal right coronary artery (RCA) with TIMI-0 flow.



**Figure 2.** Full revascularization of the RCA following deployment of the 7 mm Herculink renal artery stent (Abbott) with TIMI-3 flow.

thickness. Estimated ejection fraction was 50%. When compared to previous studies, the patient's inferior wall motion abnormalities appeared to be more prominent. Systolic and diastolic function of the right heart was grossly normal. Laboratory studies revealed an increased anion gap metabolic acidosis and a lactic acid of 6.0 mmol/L. Troponin T was elevated to 1886 ng/L, suggestive of acute cardiac injury.

Initially, a left heart catheterization was performed (Figure 1) and an attempt was made to restore blood flow through the thrombosed RCA via aspiration thrombectomy and balloon angioplasty using a 3.5 mm balloon extending through the lesion into the distal RCA. This was complicated by distal embolization and lack of reflow to the PDA with recurrent ST elevations and chest pain reported by the patient. Repeat aspiration thrombectomy and balloon angioplasty yielded TIMI-3 flow into both the PDA and posterior lateral vessel (PLV), while leaving the vessel with significant clot burden. He was monitored for two days in the intensive care unit for a trial of medical therapy (ASA 81 mg, clopidogrel 75 mg, heparin drip) with a planned repeat angiogram to assess the need for stent placement. Repeat left heart catheterization revealed a high-grade RCA stenosis with persistent thrombus within the aneurysmal vessel. A 5 mm Synergy Megatron stent (Boston Scientific) was placed into the distal RCA into

the PLV using intravascular ultrasound, but was complicated by distal embolization and lack of flow restoration. Subsequently, a 7 mm Herculink stent (Abbott Vascular) designed for use in renal arteries was deployed using a Grand Slam wire (Asahi Intecc). Stent placement was successful but was complicated by distal embolization, addressed with multiple aliquots of intracardiac nicardipine and aspiration thrombectomy. The final angiogram revealed a widely patent RCA with minimal residual stenosis (<10%) in the setting of plaque protrusion and widely patent PDA and PLV (Figure 2). The patient was discharged home on triple therapy including aspirin, clopidogrel, and warfarin, with recommendations to stop aspirin after 1 month and warfarin after 6-12 months, with a transition to rivaroxaban indefinitely for prevention of subsequent thrombotic events. The importance of medication adherence was thoroughly explained and stressed to the patient, given his previous noncompliance and subsequent repeat thrombotic event.

The patient was followed outpatient by his family medicine practitioner for monitoring of his cardiovascular status, as well as further management of his needs for anticoagulation. Two weeks post PCI he was free of angina, with no residual shortness of breath or symptoms indicating a new thrombus. His goal INR had been achieved and was holding steady at 2.6 on coumadin 10 mg daily. The patient

has since resumed his daily activities with no evidence of recurrent thrombosis.

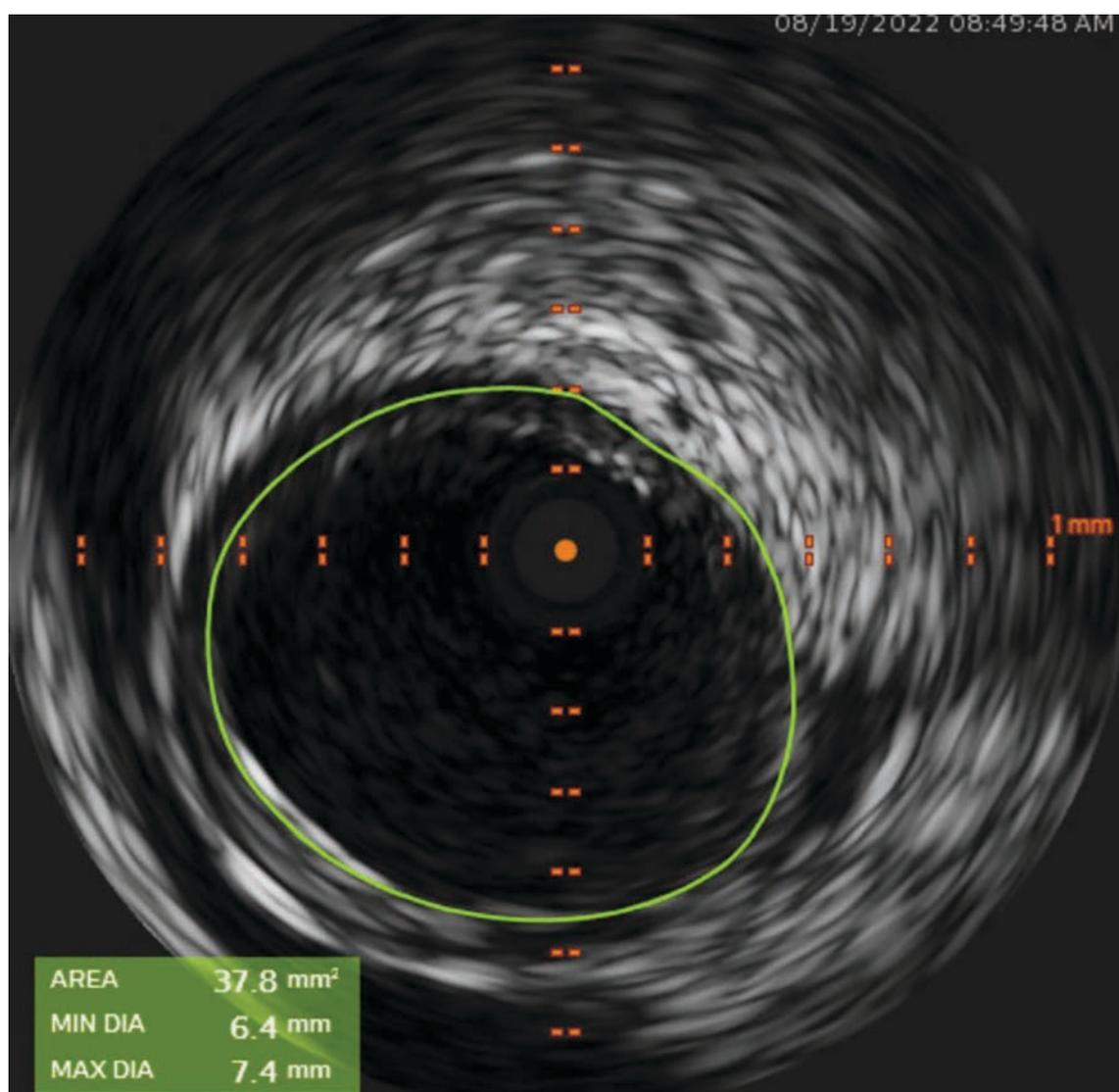
Longer follow-up data is needed to assess the long-term benefit of PCI in this population compared to management with medical therapy alone. The short-term results are positive and offer a promising direction for future studies.

## Discussion

The management of ACAD is filled with uncertainty due to the relative rarity of this condition. The treatment of acute coronary syndromes in the setting of ACAD often includes medical therapy with or without thrombus aspiration, but PCI with optimally sized stent placement is not well understood in this population.<sup>2</sup> Aneurysmal coronary arteries present a challenge in achieving the gold-standard, first-line management of ST-segment elevation MI. The highest priority in the management of acute MI is the restoration of blood flow as quickly as possible. Primary PCI, which encompasses coronary angioplasty, thrombus extraction, and stenting, is the first-line treatment to restore adequate flow as it is the most feasible, timely, and cost-effective strategy to date.<sup>3</sup>

Stent sizes are chosen using intravenous ultrasound-guided estimations of the maximum luminal diameter. Optimal sizing is achieved when the stent meets the luminal wall without overextending its boundaries, thereby allowing for endothelialization, and prevention of stent migration and thrombosis as seen with undersized stents.<sup>4</sup> Undersized stents increase the risk of restenosis and stent thrombosis, posing a challenge for this case, since the coronary arteries were dilated to the point exceeding the diameter of the largest available coronary stent (6 mm) and the patient had already failed medical therapy (Figure 3). We utilized a 7 mm Herculink stent, intended for use within renal arteries, since it was better approximated for the size of the vessel, and did not leave a significant aperture between the stent and the luminal walls. Stent placement established widely patent vasculature with minimal residual stenosis.

The Thrombolysis in Myocardial Infarction (TIMI) flow grade (Table 1) is a widely used, objective system used for assessing blood flow within the coronary arteries in the setting of acute myocardial infarction.<sup>3</sup> The values range from 0, indicating complete occlusion of the vessel, to 3, indicating full perfusion with normal flow. Our patient was determined to have TIMI-0 flow upon initial heart catheterization, which indicated the need for immediate intervention. In the population of patients without aneurysmal coronary arteries, stent placement would be the standard of care for the management of complete occlusion. After failed mechanical thrombectomy and balloon angioplasty, a large stent manufactured for use in renal arteries was used to attempt to stent this patient's massive vessel. The attempt was successful and TIMI-3 flow was established. As



**Figure 3.** Intravascular ultrasound image of the patient's aneurysmal coronary artery measuring 7.4 mm.

**TABLE 1.** Thrombolysis in Myocardial Infarction (TIMI) flow grade, as seen by angiography.

Flow Grade	Degree of Flow
TIMI 0	Complete occlusion
TIMI 1	Penetration of obstruction by contrast with no distal perfusion
TIMI 2	Perfusion of entire artery but delayed flow
TIMI 3	Full perfusion, normal flow

**Renal artery stents, such as the 7 mm Herculink stent (Abbott) utilized in this case, provide a feasible and effective means of providing successful PCI to individuals with aneurysmal coronary artery disease in the setting of acute coronary syndromes. It should be noted that utilization of these renal artery stents within the coronary vessels is an off-label use.**

highlighted by this case, the off-label use of renal artery stents within aneurysmal coronary vessels offers a feasible and safe way to provide patients with ACAD first-line treatment in the setting of acute coronary syndromes.

### Conclusion

Renal artery stents, such as the 7 mm Herculink stent utilized in this case, provide a feasible and effective means of providing successful PCI to individuals with ACAD in the setting of acute coronary syndromes. It should be noted that utilization of these renal artery stents within the coronary vessels is an off-label use. Longer follow-up data are required to better understand the long-term implications of PCI in this population. This case demonstrated promising results for the short-term management of MI in patients with aneurysmal coronary arteries and provides a point for future investigations for both short- and long-term management in this population. ■

### References

1. ElGuindy MS, ElGuindy AM. Aneurysmal coronary artery disease: An overview. *Glob Cardiol Sci Pract*. 2017 Oct 31; 2017(3): e201726. doi:10.21542/gcsp.2017.26
2. Matthew S, Timothy EP. Coronary artery ectasia: An interventional cardiologist's dilemma. *International Archives of Cardiovascular Diseases*. 2018; 2(1). doi:10.23937/IACVD-2017/1710007
3. Carville SF, Henderson R, Gray H. The acute management of ST-segment-elevation myocardial infarction. *Clin Med (Lond)*. 2015 Aug; 15(4): 362-367. doi:10.7861/clinmedicine.15-4-362
4. Scafa Udriște A, Niculescu AG, Grumezescu AM, Bădilă E. Cardiovascular stents: a review of past, current, and emerging devices. *Materials (Basel)*. 2021 May 12; 14(10): 2498. doi:10.3390/ma14102498

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