

Aorta: Case Report

Diffuse Coronary Vasospasm After Zone 2 Debranching and Antegrade TEVAR



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Coronary vasospasm involves constriction of the coronary arteries and has been described after manipulation of the coronary arteries (ie, after stenting or bypass grafting). This report details the case of a 57-year-old man who presented with an endoleak after thoracic endovascular aortic repair. He underwent a frozen elephant trunk procedure and postoperatively had diffuse coronary vasospasm, demonstrated on pre- and post-vasospasm cardiac catheterization. He required venoarterial extracorporeal membrane oxygenation for hemodynamic support and experienced complete recovery of cardiac function over the subsequent week. This case highlights the rarity of diffuse coronary vasospasm, documents its possibility after aortic surgery, and characterizes its successful treatment.

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Coronary vasospasm is an exceedingly rare clinical event and has been documented after cardiac surgery, with an estimated incidence of approximately 0.1% after coronary artery bypass grafting.¹ The primary symptom is chest pain or discomfort, which can vary widely in intensity, although coronary vasospasm may also manifest as cardiogenic

shock in an intubated or sedated patient. The pathogenesis is not entirely clear. It may be initiated by endothelial dysfunction or some other vascular disturbance that originates with conduit harvesting or vascular anastomosis. The combination of this predisposition and exposure to certain factors such as cold, emotional stress, and medications is thought to lead to spasm.² Previous reports have highlighted vasospasm after cardiac manipulation, including coronary artery bypass grafting and valvular replacement.¹⁻⁵ Here we describe a case of diffuse coronary vasospasm after aortic surgery.

A 57-year-old man with end-stage renal disease treated with hemodialysis who had recently undergone thoracic endovascular aortic repair (TEVAR) was transferred urgently to our institution at the University of Florida with hypertension, chest pain, and a new type Ia endoleak (Figure 1). In preparation for urgent open repair, he underwent left-sided heart catheterization, which did not reveal any significant coronary artery disease. Echocardiography showed a normal ejection fraction (60%) without valvular abnormalities. He then underwent a staged series of operations consisting of a left carotid-subclavian bypass followed by a “frozen elephant trunk,” with antegrade deployment of an endovascular stent graft through his existing TEVAR stent. He tolerated the procedures well and was making good progress during his initial postoperative hours. However, 12 hours postoperatively, he experienced refractory cardiogenic shock with ST-segment changes that required high-dose pressors and eventual venoarterial extracorporeal membrane oxygenation (VA ECMO). Emergency left-sided cardiac catheterization revealed diffuse spasm of his coronary arteries (Figure 2), and he was started on nitroglycerin and diltiazem in addition to placement of an intraaortic balloon pump. On postoperative day (POD) 5, echocardiography indicated recovery of his ejection fraction, and he was weaned from VA ECMO, with balloon pump removal the next day. He was slowly weaned from sedation and mechanical ventilation, and he was extubated on POD 8. He was bridged with

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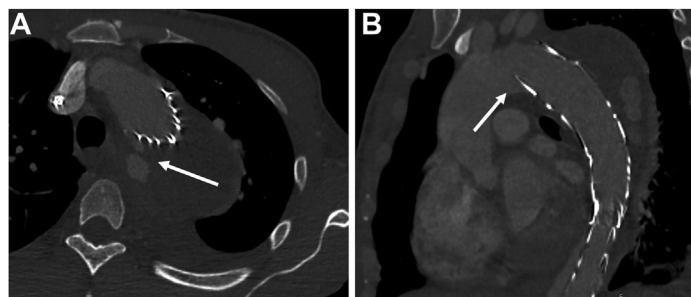


FIGURE 1 Computed tomographic angiogram with (A) axial and (B) sagittal projection indicating areas of contrast extravasation around a thoracic endovascular stent representing a type Ia endoleak. Arrows denote regions of contrast extravasation.

continuous renal replacement therapy and transitioned back to intermittent hemodialysis. His condition gradually improved, and he was discharged to an inpatient rehabilitation facility on POD 30.

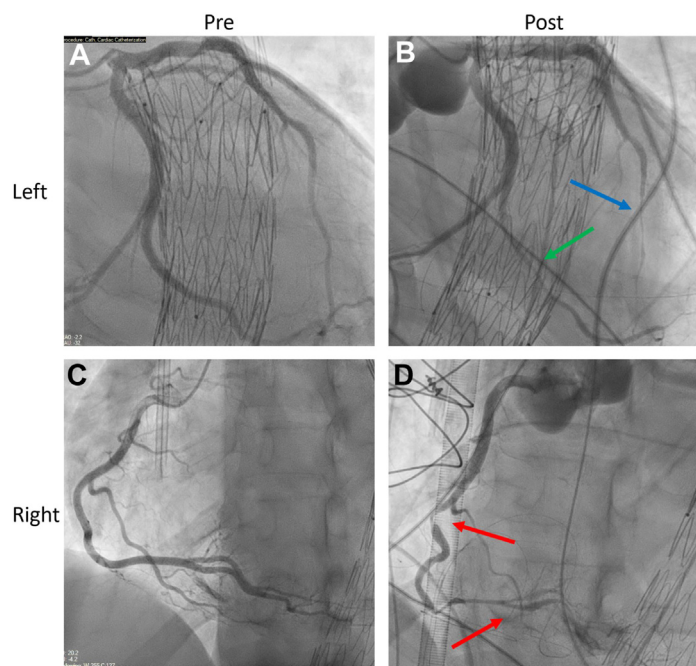


FIGURE 2 Coronary angiogram of the right and left coronary circulation before surgery (Pre) and immediately after his arrest demonstrating vasospasm (Post). Preoperative angiography indicated patent (A) left and (C) right coronary vessels without significant coronary disease. Immediate postarrest angiography indicated spasm within (B) the left anterior descending artery, (B) circumflex (green arrow pointing to the obtuse marginal branch), and (D) right (red arrows pointing to the right coronary artery and posterior descending artery) coronary territories.

COMMENT

Coronary vasospasm is a known complication of cardiac surgery but has usually been described after bypass grafting¹ or valvular replacement.²⁻⁴ This case report describes an incident of coronary vasospasm after aortic surgery. Although this is a rare entity overall,¹ one must maintain a high index of suspicion because patients often have only minutes before an intervention is needed. In cases of refractory cardiogenic shock after cardiopulmonary bypass, it is prudent to begin with inotropic agents and vasopressors to temporize the hemodynamics. With electrocardiographic changes and continued hemodynamic instability, left-sided heart catheterization is a logical next step because this can establish a diagnosis of myocardial infarction (a more common complication after cardiac surgery) or coronary vasospasm. Once the condition is recognized, prompt initiation of nitroglycerin, calcium channel blockers, or other vasodilators can alleviate the spasm. Minimization of vasospastic and proarrhythmogenic medications is also prudent. If the patient remains hemodynamically unstable, then initiation of mechanical support will be necessary. An intraaortic balloon pump or VA ECMO may prove beneficial to improve coronary perfusion and provide afterload reduction to reduce myocardial workload.⁴ In this case, the patient had continued profound cardiogenic shock that would not have been alleviated with a balloon pump alone, so we elected to proceed with VA ECMO.

After several days of temporizing hemodynamics, resting the heart, and initiating calcium channel blockers, his cardiac function gradually recovered completely, and he was liberated from mechanical support. The remainder of his hospital course proceeded as expected, and he was discharged to an inpatient rehabilitation center in good condition.

This case outlines the importance of maintaining a high index of suspicion for vasospasm and initiating prompt treatment. This case provides evidence that coronary vasospasm can occur after any cardiac surgery requiring cardiopulmonary bypass, not just after bypass grafting or valvular replacement.

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DISCLOSURES

The authors have no conflicts of interest to disclose.

PATIENT CONSENT

Obtained.

REFERENCES

1. Lorusso R, Crudeli E, Lucà F, et al. Refractory spasm of coronary arteries and grafted conduits after isolated coronary artery bypass surgery. *Ann Thorac Surg*. 2012;93:545-551. <https://doi.org/10.1016/j.athoracsur.2011.09.078>
 2. Shafei H, Bennett JG. Coronary artery spasm during mitral valve replacement. *Eur J Cardiothorac Surg*. 1990;4:398-400. [https://doi.org/10.1016/1010-7940\(90\)90050-a](https://doi.org/10.1016/1010-7940(90)90050-a)
 3. Stoica AI, Harpa M, Banceu CM, Kovacs J, Suci H. Severe coronary artery vasospasm after mitral valve replacement in a diabetic patient with previous stent implantation: a case report. *J Crit Care Med (Targu Mures)*. 2022;8:131-135. <https://doi.org/10.2478/jccm-2022-0005>
 4. Weissman CR, Leung Wai Sang S. Proper treatment and management of postcardiotomy refractory vasospasm. *Case Rep Cardiol*. 2023;2023:9988680. <https://doi.org/10.1155/2023/9988680>
 5. Mussie E, DeWitte N, Goulet M, Garfield J. Coronary artery vasospasm after mechanical aortic valve replacement: a case report. *Cureus*. 2023;15:e49747. <https://doi.org/10.7759/cureus.49747>
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