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Percutaneous Coronary Intervention as a Bridge Therapy for Aortic Dissection Related Bilateral Coronary Malperfusion: A Case Report

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ABSTRACT

Dealing with coronary artery caused by aortic dissection remains a great challenge in the treatment of aortic dissection. Here, we present the case of a 57-year-old woman, who initially detected chest pain, and electrocardiography showed ST elevation myocardial infarction. After primary percutaneous coronary intervention, aortic dissection accidentally was detected. She then received central repair and had a satisfied outcome. We proved that percutaneous coronary intervention as a bridge therapy for aortic dissection related coronary malperfusion may be an efficient therapy.

INTRODUCTION

Aortic dissection has been identified as a fatal disease for years. It sometimes can involve the ostium of the coronary artery, leading to malperfusion of the coronary artery; it's also easy to misdiagnose as acute myocardial infarction (AMI) [Zhu 2017]. When it occurs, it often is catastrophic, due to delay in diagnosis and acute heart failure. Furthermore, the management is controversial, as there are only a few case reports and no current guidelines for treatment. Here, we present a case with bilateral coronary malperfusion secondary to aortic dissection, which first was treated by percutaneous coronary intervention, then the patient was transferred to a cardiovascular surgeon for operation with a satisfied outcome.

CASE REPORT

A 57-year-old Taiwanese woman, with a history of hypertension, was sent to the emergency department with presentation of chest pain. She suffered from sudden loss of consciousness at 12:00 and recovered after she went to a local clinic. However, the patient's chest pain was exaggerated by 21:00. The patient then was sent to the emergency department. In triage, she had a low blood pressure of 92/68 mmHg, temperature 37'c, and pulse rate of 61 beats per minute. Lab data showed hs-Troponin I 50.5pg/Ml. EKG showed ST elevation in V2 lead with reciprocal ST depression in lead II, III, aVF and V6. (Figure 1) As ST elevation myocardial infarction (STEMI) was impressed, she received emergent cardiac catheterization, which showed RCA ostium 95% stenosis and LAD ostium 99% stenosis. A drug-eluting stent was inserted in the LAD ostium, LAD- distal and RCA ostium area and showed TIMI3 flow. (Figure 2) An intra-aortic balloon pump was inserted, and dopamine was prescribed for hemodynamic unstable status. This patient then was sent to the intensive care unit for further care. Aspirin and Prasugrel were given. Due to the impression of cardiogenic shock, we followed up echo soon after primary PCI, at 1:30AM. However, the cardiac echo detected aortic intima flap near the aortic root, with poor left ventricular ejection fraction of 40%. Emergent computed tomography was done and showed aortic dissection, Stanford type A. (Figure 3) The aortic dissection involved the ascending aorta. Cardiovascular surgeon consultation was done, and she was sent to emergency operation at 02:50AM. The operation of ascending aorta replacement by 26mm graft smoothly was processed (Figure 4), and she was transferred to the ward on day 21 after admission. (Figure 4) The patient was discharged after another 7 days, with total independence of daily living activities. Follow-up echo after discharge showed left ventricular ejection fraction of 33%.

DISCUSSION

In our case, aortic intima flap leads to both LCA and RCA ischemia events and showed ST elevation on electrocardiogram. We demonstrated a case with good management after misdiagnosis, and we also proved that emergent PCI first followed with cardiovascular surgery may be a solution to AMI secondary to aortic dissection.

According to German registry and Japanese published data, the incidence of coronary malperfusion caused by aortic dissection is 10% [Czerny 2015] and 9.3% [Imoto 2013]. Due to its low morbidity and high mortality, no standard treatment regimen has been made. Preoperative PCI first or straight to the operation room for central repair is still controversial. In whole PCI procedure, coagulation drugs like heparin or low molecular weight heparin (LMWH) are essential and may

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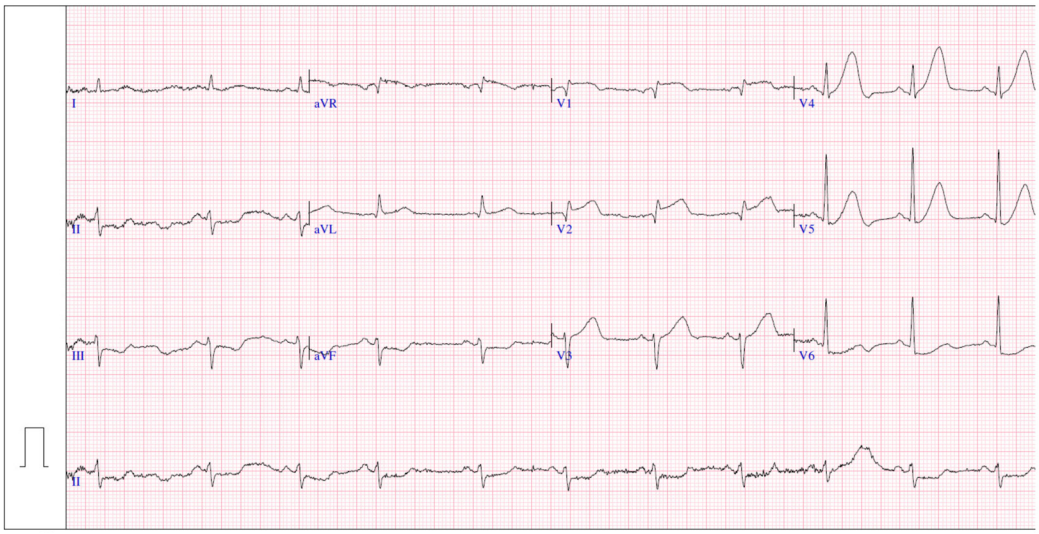

Figure 1. Electrocardiogram in the emergency room. Anterior wall AMI was impressed.

lead to aPTT prolong and bleeding tendency. It also takes time to completed the procedure. Therefore, preoperative PCI may delay central repair surgery and may increase the risk of fatal cardiac tamponade. However, some evidence showed the benefits of PCI for ensuring coronary blood flow and preventing acute heart failure outweigh the risk of worsening cardiac tamponade.

In previous case reports, Sharma et al. published a successful treatment for spontaneous coronary dissection using a catheter and a cutting balloon to decompress the false lumen, which can create a reentry way and preserve the coronary flow [Sharma 2019]. Cho et al. presented a successful rescue procedure using only a guidewire [Cho 2021]. This can be considered another safe answer in similar situations. Wang et al. presented a case with successful treatment of acute myocardial infarction due to type A aortic dissection by right coronary artery stenting [Wang 2015]. Thus, given the unstable hemodynamic condition, due to overt myocardial ischemia, reestablishing blood flow by cardiac catheterization stenting also is reasonable.

Coronary malperfusion may be an ever-changing occlusion, with reocclusion and spontaneous return of blood flow after aortic dissection. Therefore, in some patients, reperfusion time may take 2-3 hours, resulting in excessive ischemic myocardial injury, but PCI can more quickly restore cardiac function. We cannot predict the self-recovery of the coronary arteries, nor can we afford the time for central repair in the face of sudden acute heart failure.

In Uchida et al.'s 2018 retrospective study, they concluded that immediate preoperative PCI must be performed in patients with poor left coronary perfusion. For patients with poor right coronary perfusion, they also recommended preoperative PCI, due to significantly reduced mortality [Uchida 2018]. Left coronary artery perfusion influences most left ventricular ejection fraction and may cause cardiogenic shock; right coronary artery also induces right heart failure, and both could lead difficulty to wean

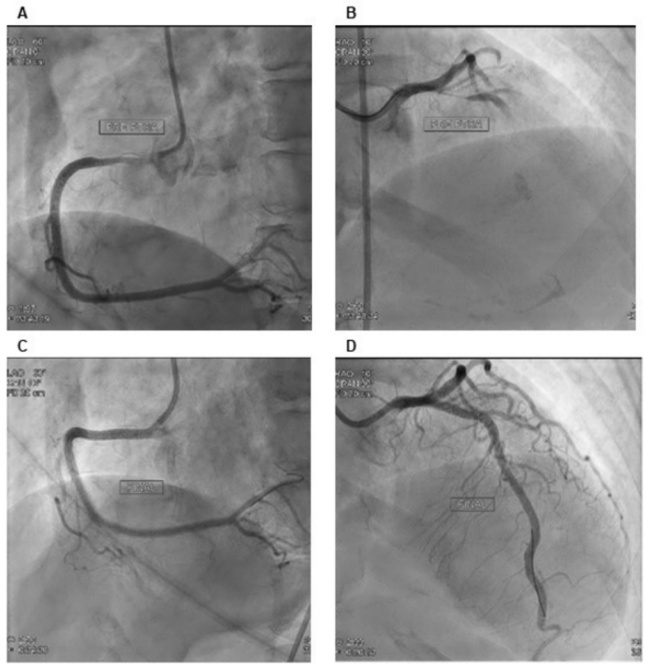

Figure 2. Coronary angiography. (A) Basal angiogram showing ostium occlusion of the right coronary artery. (B) Ostium occlusion of the LAD. (C)(D) After stenting, RCA and LAD achieved TIMI 3 flow.

patients from extracorporeal membrane oxygenation system and results in poor prognosis. Preoperative PCI may delay central repair surgery and may increase the risk of dreadful cardiac tamponade. However, the benefits of PCI in protecting cardiac function exceed the risk of cardiac tamponade. Indications for PCI prior to central repair in patients with poor coronary perfusion should be discussed case by case, especially considering the presence of cardiac tamponade, the severity of acute myocardial injury, cardiogenic shock,

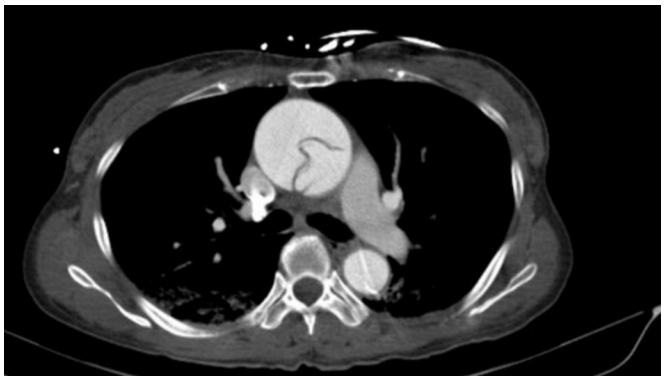

Figure 3. Computed tomography showed intima flap and aortic dissection was detected.

and most importantly of emergent availability of a cardiologist or cardiac surgeon, and the preparation time of operating room. Also, we should do our best to avoid misdiagnosis and delayed diagnosis. It could save more time and save the ischemic cardiac muscle.

According to AMI guidelines, the door to wire time of emergent PCI should be done in 90 minutes, and in our case revascularization time was 80 minutes to achieve coronary revascularization. It takes about 10 hours from the initial symptom attack to primary PCI. LV angiography was not routine while primary PCI, thus aortic dissection was not initially detected. Fortunately, the cardiac echo was done after the primary PCI, and misdiagnosis was corrected. It took about 2 hours between the completion of PCI and sending the patient to the operation room. The patient was under coagulopathy status, and the operation was still done after 10 hours. Follow-up cardiac echo was performed one month later, and left ventricular ejection fraction showed 33%. The patient is symptom-free. Our management may be better, compared with going straight to the operating room. No cardiac tamponade was found, while we did the cardiac echo after PCI. We still recommend performing cardiac echo first in the emergency room especially in the doubt of fatal aortic dissection. There are no previous reports about treatment of emergent PCI to both the left coronary artery and right coronary artery ostium in an aortic dissection case. However, we believed that without emergent PCI, this patient could have resulted in an unstable hemodynamic condition, due to obvious and more severe myocardial ischemia. Thus, percutaneous coronary intervention as a bridge therapy for aortic dissection related coronary malperfusion may be an efficient and safe therapy. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

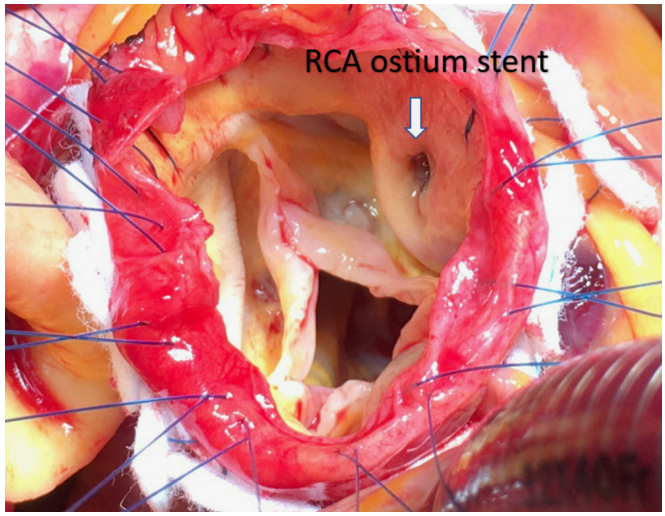

Figure 4. RCA ostium stent during ascending aorta replacement.

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