Successful Management of Post-operative Very Late Stent Thrombosis Using Extracorporeal Membrane Oxygenation Device

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Introduction

Although the introduction of drug-eluting stents (DESs) has an epochal development in the management of patients with coronary artery disease, those have been suggested to be associated with a significant increase in the incidence of stent thrombosis.(1) Moreover, rate of myocardial infarction (MI) and death related to stent thrombosis have ranged from 25% to 65% and 45% to 75%, respectively.(2) We describe our experience of successfully managing irreversible cardiac arrest caused by very late stent thrombosis in postanesthesia care unit, using extracorporeal membrane oxygenation (ECMO) device.

Case Description

A 66-year-old woman who twice underwent percutaneous coronary interventions (PCIs) with DESs was scheduled for total thyroidectomy for a papillary thyroid cancer. Forty-one months before the operation, 4 sirolimus-eluting stents (Cypher, Cordis, Miami Lakes, FL) were placed in left anterior descending artery (LAD), left circumflex artery (LCx), and right coronary artery. Six month later, the second PCI was performed with 2 paclitaxel-eluting stent (Taxus Express 2, Boston Scientific, Natick, MA) in left main coronary artery and LCx because of exertional chest pain related to the stent thrombosis. Dual antiplatelet therapy with aspirin and clopidogrel was continued for 6 month after the 1st and the 2nd PCIs, respectively.

A follow-up coronary angiogram (CAG) showed an absence of in-stent restenosis or thrombosis. Preoperative assessment revealed no cardiac abnormality except mild hypokinetic wall motions in LCx territory. The consultation of cardiology suggested the progress of the scheduled operation with the cessation of aspirin 10 days before surgery. After the arrival in the operating room, pulse oxymetry, non-invasive arterial pressure and 5-lead electrocardiogram were applied. Anesthesia was induced with etomidate and fentanyl and maintained with inhaled sevoflurane. Neuromus-
circular block was achieved with rocuronium. After anesthesia induction, invasive arterial pressure was also monitored continuously through the radial arterial cannulation. During anesthesia, the patient was maintained hemodynamically stable. To prevent tachycardia related to airway manipulation, esmolol 20 mg was administered intravenously just before intubation and extubation, respectively.

After the successful extubation, the patient was transferred to the postanesthesia care unit. After 60 minutes after the arrival in the postanesthesia care unit, cardiac arrest was developed following abrupt appearance of severe bradycardia and QRS widening. Cardiopulmonary resuscitation (CPR) was immediately started. Because the patient was not recovered from cardiac arrest in spite of adequate resuscitation, ECMO was started at 30 minutes after CPR. Arterial pressure and heart rhythm were restored after the initiation of ECMO and the application of defibrillation. Emergent CAG revealed acute thrombosis at the site of her DES in the left main coronary artery to proximal LAD and LCx (Fig. 1). Removal of thrombus was performed at LAD to LCx. Following intervention, the patient was transferred to intensive care unit (ICU).

Transthoracic echocardiography performed in ICU showed apex akinesia and severe anterior and anterolateral hypokinesia. Left ventricular ejection fraction was measured below 30%. Six days after cardiac arrest, ECMO was successfully weaned. In addition, she presented no neurologic complication.

However, from a few days after weaning, the hemodynamic condition of the patient became worse progressively in spite of supporting inotropics, vasopressors and intra-aortic balloon pump. We could not expect more improvement of her cardiac dysfunction and decided to wait out the chance of heart transplantation on keeping the conservative treatment. On postoperative 61 days, heart transplantation was performed uneventfully. On 106 days after cardiac arrest, the patient was discharged without any complication.

**Discussion**

DESs were developed to prevent neointimal hyperplasia (medial hyperproliferation) and consequent restenosis while preserving vessel architecture compromised by percutaneous transluminal coronary angioplasty.(3) Both sirolimus and paclitaxel effectively inhibit vascular smooth cell migration and proliferation, although by different intracellular mechanisms.(2) However, there have been many reports of late thrombosis after implantation of DESs followed by cessation of antiplatelet therapy or even on dual antiplatelet medication continuation.(4,5)

The overall incidence of DES thrombosis has been reported between 0.5% and 3.1%. (2) However, the first symptom of DES thrombosis is frequently presented as the fetal complication such as MI or death. Moreover, abrupt cessation of aspirin results in a rebound phenomenon, whereby both cyclooxygenase-1 and thrombo-
xane B2 levels increase rapidly no returning to baseline for 3~4 days.(6) Therefore, 12-month of dual-antiplatelet therapy with aspirin and clopidogrel and lifelong medication of aspirin were strongly recommended after DES insertion.(7,8) In addition, it has been also recommended that aspirin should never be interrupted unless the risk of bleeding far outweighs the risk of stent thrombosis in patients with DESs during perioperative period.(7,8) Nevertheless, antiplatelet therapy was often discontinued to decrease the risk of bleeding during perioperative period.

In our case, a cardiologist recommended the cessation of aspirin 10 days before surgery. Comparing between the risk of bleeding during or after total thyroidectomy and that of DES thrombosis, the appropriateness of this consultation might be questionable.

Although there has been no report about the efficiency of using ECMO in patients with DES thrombosis, our treatment of choice was the use of ECMO to support circulation. There were two reasons as follows. First, our patient was not responsible to all adequate resuscitation methods. So, the only way to extend the patient’s life could be the mechanical support of circulation. Second, the most possible cause of cardiac arrest in this patient was stent thrombosis. Therefore, in our opinions, the patients would need to gain time till removing stent thrombosis.

ECMO uses conventional cardiopulmonary bypass technology to support the circulation with continuous nonpulsatile cardiac output and extracorporeal oxygenation. Moreover, it is very efficient in emergent situations, because ECMO can be quickly set up and easily inserted at bedside within 30 minutes. However, long-term use of ECMO develops several serious complications including multiorgan system failure, resistant vasoplegia, coagulopathy, and stroke.(9) Therefore, ECMO was applied in this patient until severe cardiac dysfunction was recovered. In addition, ECMO could use successfully as a bridge to heart transplantation.(10)

A few days after the successful weaning of ECMO, the patient’s condition including cardiac function became worse progressively. And finally, heart transplantation was needed for the patient’s survival because inotropics, vasopressors, and even intra-aortic balloon pump failed to maintain the hemodynamic stability. It was very hard to tell the exact cause of this event in ICU. Things we knew were that the first insult in this patient was MI cause by stent thrombosis and that there was no chance for survival in this patient if you did not use ECMO.

In conclusion, the patients with DES(s) should be carefully monitored during the entire perioperative period. In addition, when fatal cardiac complications irreversible to adequate resuscitation developed in those patients, ECMO might be considered as a life-sustaining bridge to permanent treatment.

Abstract

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During perioperative period, patients with drug-eluting coronary stents are at risk of thrombosis-related
myocardial infarction. This unpredictable complication is sometimes fatal. We report a case of successful management using extracorporeal membrane oxygenation (ECMO) device in the patient with cardiac arrest irresponsive to general resuscitation followed by very late stent thrombosis in postanesthesia care unit. ECMO might be considered as an option of managing in this condition as a mediator to ultimate therapy.

**Key Words:** Coronary thrombosis, Extracorporeal membrane oxygenation, Heart arrest

**References**