

An Ideal Vascular Access in a Patient with Acute Coronary Syndrome and Cardiogenic Shock: The Arterial Cannula of Veno-Arterial Extracorporeal Membrane Oxygenation

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INTRODUCTION

Acute coronary syndrome (ACS) is a medical emergency and caused 1.8-2.3% of overall in-hospital mortality in Taiwan.¹ Cardiogenic shock (CS) complicates in patients with severe coronary artery disease, among them mechanical circulatory support like intra-aortic balloon pump (IABP) and extracorporeal membrane oxygenation (ECMO) is mandatory as a “bridge-to-decision” therapy.² Prompt angiographic diagnosis and revascularization are crucial to have good prognosis.^{3,4} However, sometimes it is time-consuming to find a vascular access in such patients.

Herein we reported a case with ACS and CS in which both femoral arteries were occupied by IABP and ECMO. The arterial cannula of ECMO allowed for a fast and feasible access to perform diagnostic coronary arteriography (CAG) and percutaneous coronary intervention (PCI).

CASE

A 64-year-old man had been well until 1 day before admission. He presented to the emergent department with acute chest pain and diaphoresis. On examination, his heart rate was 107 beats per minute, blood pressure was 83/56 mmHg, respiratory rate was 20 per minute,

and the breathing sound was moisture. An electrocardiogram (ECG) showed ST segment depression in lead I, II, aVL, aVF, V4-6, and ST segment elevation in lead III, V1-2, and aVR. The patient underwent an emergent coronary angiography by right femoral approach, however, pulseless electrical activity developed while we were doing diagnostic CAG. Veno-arterial ECMO (VA-ECMO) was established immediately via the left femoral artery and vein, and the angiographic sheath in the right femoral artery was alternated to IABP. Because of very low blood pressure, no other vascular access could be found manually. We punctured the arterial cannula of VA-ECMO with an 18-Gauge needle, and inserted a 6 French long sheath (Flexor Introducer, Cook Medical, Bloomington, Indiana, U.S.A.) into it by regular manner (Figure 1). The diagnostic CAG revealed total occlusion of middle right coronary artery (RCA) (Figure 2A), and there were a 90% stenosis in the left main coronary artery shaft and chronic total occlusion in the proximal left anterior de-

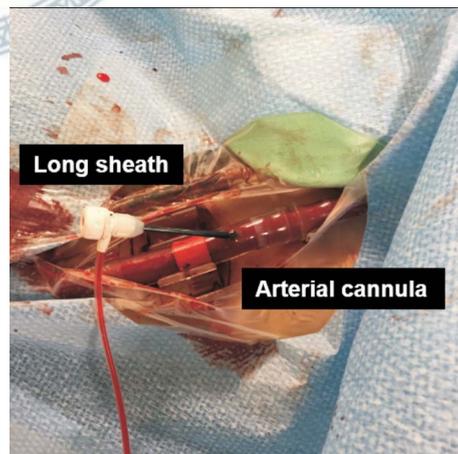


Figure 1. A non-kinked 6 French long sheath was inserted into the arterial cannula of veno-arterial extracorporeal membrane oxygenation, which was inside the left femoral artery.

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scending coronary artery (LAD) and proximal left circumflex coronary artery (LCX) (Figure 2B & C). There were Rentrop grade 2 collaterals from diagonal to obtuse marginalis branch, but the LAD territory was not perfused by visible collaterals. We thought the RCA occlusion being culprit lesion on the basis of ECG and CAG. After wiring with a workhorse guidewire, balloon dilatation with 1.0×10 mm and 2.5×15 mm semi-compliant balloon catheters was performed at nominal pressure (Figure 2D). Thrombolysis In Myocardial Infarction grade 3 flow was restored (Figure 2E) and collaterally circulated to the distal LAD (Figure 2F). Finally, the punctured segment of arterial cannula was cut, and both sides of it were reconnected.

One day after admission, the patient underwent coronary artery bypass surgery with left internal mammary artery being anastomosed to the LAD, 2 saphenous venous grafts to the posterior descending anterior and diagonal branch separately. Mechanical circulatory support was removed on day 10, and he was discharged on day 46 without neurologic complication.

DISCUSSION

ACS complicated by circulatory failure requires immediate mechanical circulatory support. In a meta-analysis of prognostic impact of IABP in patients with ACS, the use of IABP before PCI reduced in-hospital, 3- and 6-month mortality.⁵ Extracorporeal cardiopulmonary resuscitation also improves survival rate to discharge and 1-year survival rate in patients with in-hospital cardiac arrest, compared to conventional cardiopulmonary resuscitation.^{2,6} IABP and ECMO are treatment of choice based on the on-site availability. In an emergent setting, femoral artery is the most feasible vascular access owing to its large vessel diameter. Nevertheless, both aforementioned devices can occupy accessible vessels, and there is no available vessel for angiographic diagnosis and revascularization for patients with ACS.

In our case with CS, it was difficult to palpate radial or brachial arteries, which might be caused by extremely low blood pressure or vasoconstriction due to administration of high-dose inotropes and vasopressors. In this situation, VA-ECMO cannula allowed for a second-choice of vascular access. VA-ECMO drains blood from

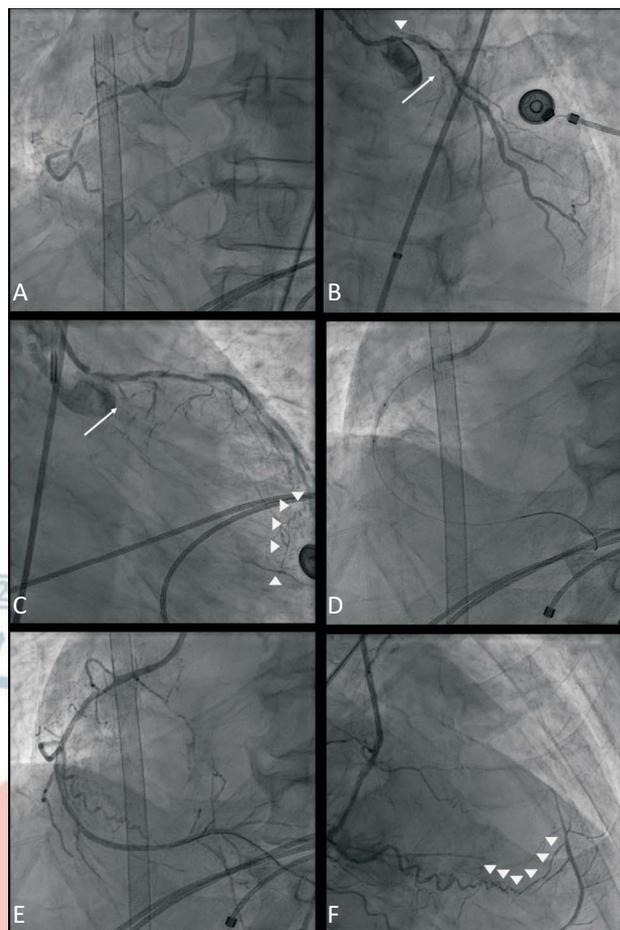


Figure 2. A diagnostic coronary angiography showed occluded RCA (A), stenosed left main coronary artery (B, arrowhead), and chronic total occlusion in LAD (B, arrow) and LCX (C, arrow). Rentrop grade 2 collaterals came from diagonal to OM branch (C, arrowheads). Balloon dilatation with a 2.5×15 mm semi-compliant balloon catheter for middle RCA occlusion (D). Post-interventional angiography of the RCA (E); The LAD was re-perfused by collaterals from the RCA (F, arrowheads). LAD, left anterior descending coronary artery; LCX, left circumflex coronary artery; OM, obtuse marginalis; RCA, right coronary artery.

right atrium, oxygenates and returns it back into the body via femoral artery. The arterial cannula is usually 15-19 French of size, and it is large enough for coronary guiding catheters to pass (6-8 French). Cannula thrombosis is not a concern due to lumen size discrepancy. The only problem is that the wall of arterial cannula is thick and regular vascular sheaths can be kinked if they were not metal-braided. That was the reason why we used a non-kinked long sheath. By this artificial vascular access, bleeding through the puncture site was minimal and there was no need for another hemostasis after the procedure. It is one of the advantages of this approach

that we do not have to discontinue heparinization administered for intravascular devices.

LEARNING POINTS

In a patient with ACS complicated by CS, bilateral femoral arteries might be occupied by both IABP and VA-ECMO. The arterial cannula of VA-ECMO is an ideal vascular access because of its easy accessibility and safety.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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