



Case Report

Percutaneous intervention for an occluded left Cabrol graft

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ABSTRACT

Percutaneous intervention for surgical reconstruction of a coronary artery is a challenging and complex procedure for interventional cardiologists. Particularly in settings of acute coronary syndrome, urgent revascularization may be critical for the prognosis of patients. Therefore, it is important that physicians have knowledge of various surgical techniques for coronary reconstruction. The Cabrol procedure is one of the surgical techniques after aortic root replacement, but it is rarely used at present. Here we describe a case of successful percutaneous revascularization for an occluded left Cabrol graft in acute ST-elevation myocardial infarction with cardiogenic shock.

<Learning objective: Percutaneous intervention for surgical reconstruction of coronary artery is challenging. In coronary artery reconstruction, computed tomography angiography might be extremely useful. We describe a case of successful percutaneous revascularization for the occluded left Cabrol graft.>

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Introduction

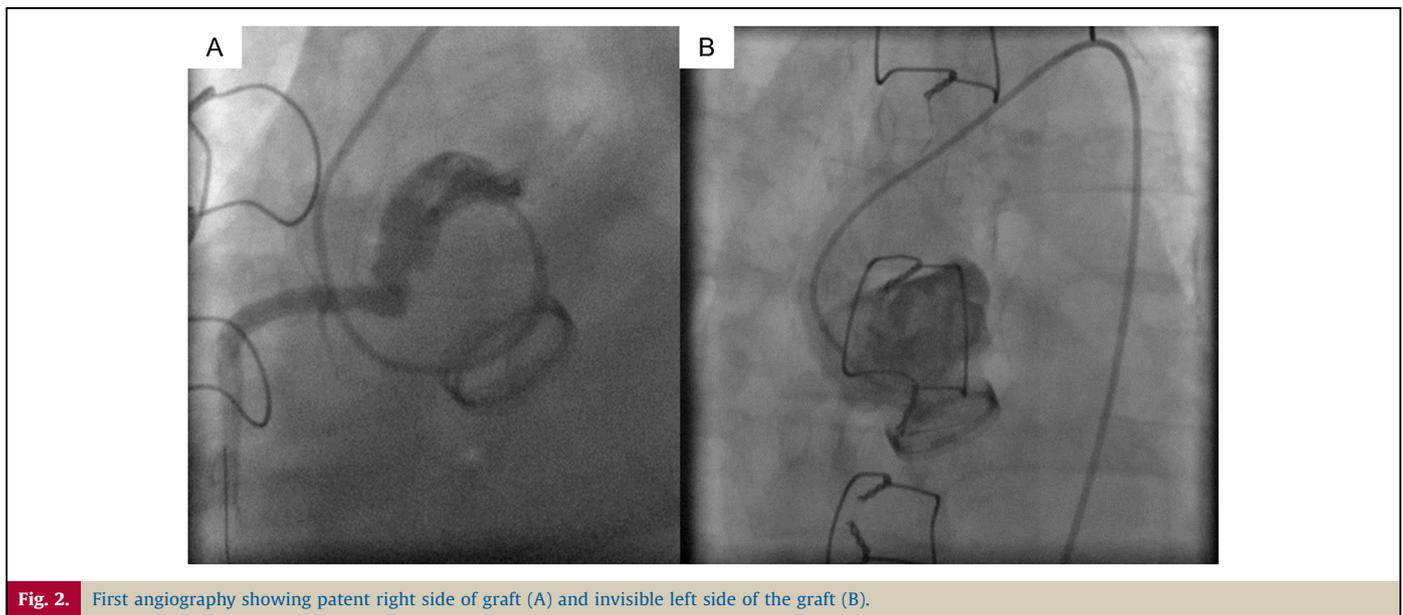
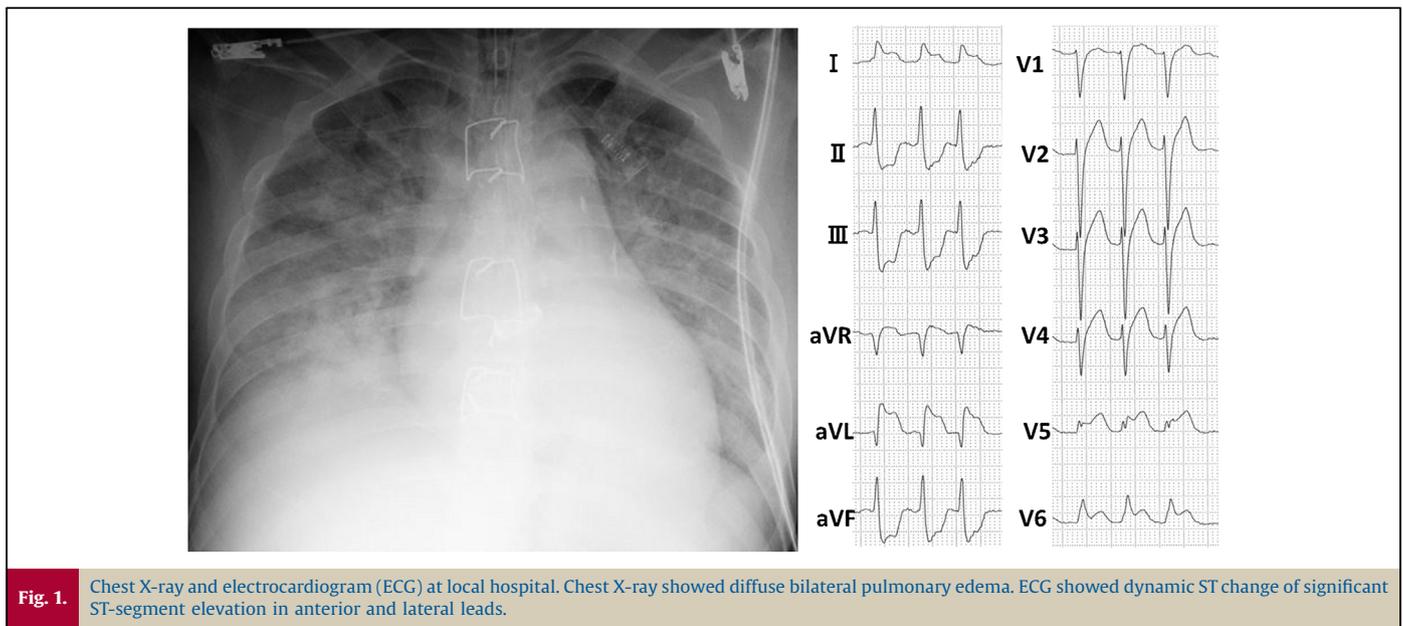
Percutaneous revascularization with angioplasty and stenting as a treatment for ST-elevation myocardial infarction (STEMI) is one of the most important advancements in the past three decades. However, interventional cardiologists may encounter unusual and challenging settings for urgent percutaneous interventions to treat complex anatomy of anomalies, coronary artery bypass grafting (CABG), or the other surgical reconstructed coronary arteries after aortic root replacement. The Cabrol technique is a surgical technique for reconstruction of coronary arteries after aortic root replacement. It uses a Dacron graft interposed between the aortic root graft and native coronary artery [1]. At present, this technique is used only when the Bentall procedure or routine application of its button technique is not feasible. Therefore, most interventional cardiologists have little experience or knowledge of this technique; furthermore, a percutaneous approach may be complicated. We report a case of urgent percutaneous revascularization to an occluded Cabrol graft in a patient who presented with STEMI complicated by cardiogenic shock.

Case report

A 44-year-old male—who had undergone cardiac surgery with Cabrol type aortic root replacement because of ascending aortic

aneurysm 5 years previously at our hospital—presented with 2 h of intermittent chest pain at a local community hospital. At that presentation, his blood pressure was 78/39 mmHg and heart rate was 112 bpm with irregular rhythm. His cardiac biomarkers were negative. He took warfarin and the prothrombin time-international normalized ratio (PT-INR) was 1.71. Chest X-ray revealed diffuse bilateral pulmonary edema (Fig. 1, left panel), electrocardiogram showed dynamic ST change of significant ST-segment elevation in anterior and lateral leads (Fig. 1, right panel), and echocardiogram revealed akinesis of anterior and lateral walls, which made the diagnosis of STEMI complicated by cardiogenic shock. He was immediately intubated and taken to the catheterization laboratory for emergent percutaneous revascularization where intra-aortic balloon pump (IABP) was placed. However, his operative notes were not available at the local hospital. Although various types of catheters were used for diagnostic angiography and aortography was performed in various angles of view, the left Cabrol limb ostia of the graft could not be found (Fig. 2). Given his presentation and the angiographic finding, STEMI caused by the occluded left Cabrol limb was highly suspected. The decision was made to transfer him to our hospital for management, including surgical revascularization. The patient was transferred to our hospital with IABP. Upon his arrival at our hospital, a brief discussion was immediately held with his family members and our cardiac surgeons. His surgical risk was estimated to be very high given hemodynamic instability and previous thoracic surgery. Therefore, we decided to proceed with percutaneous revascularization to the left Cabrol limb graft or left coronary artery. We assessed the detailed anatomy from his

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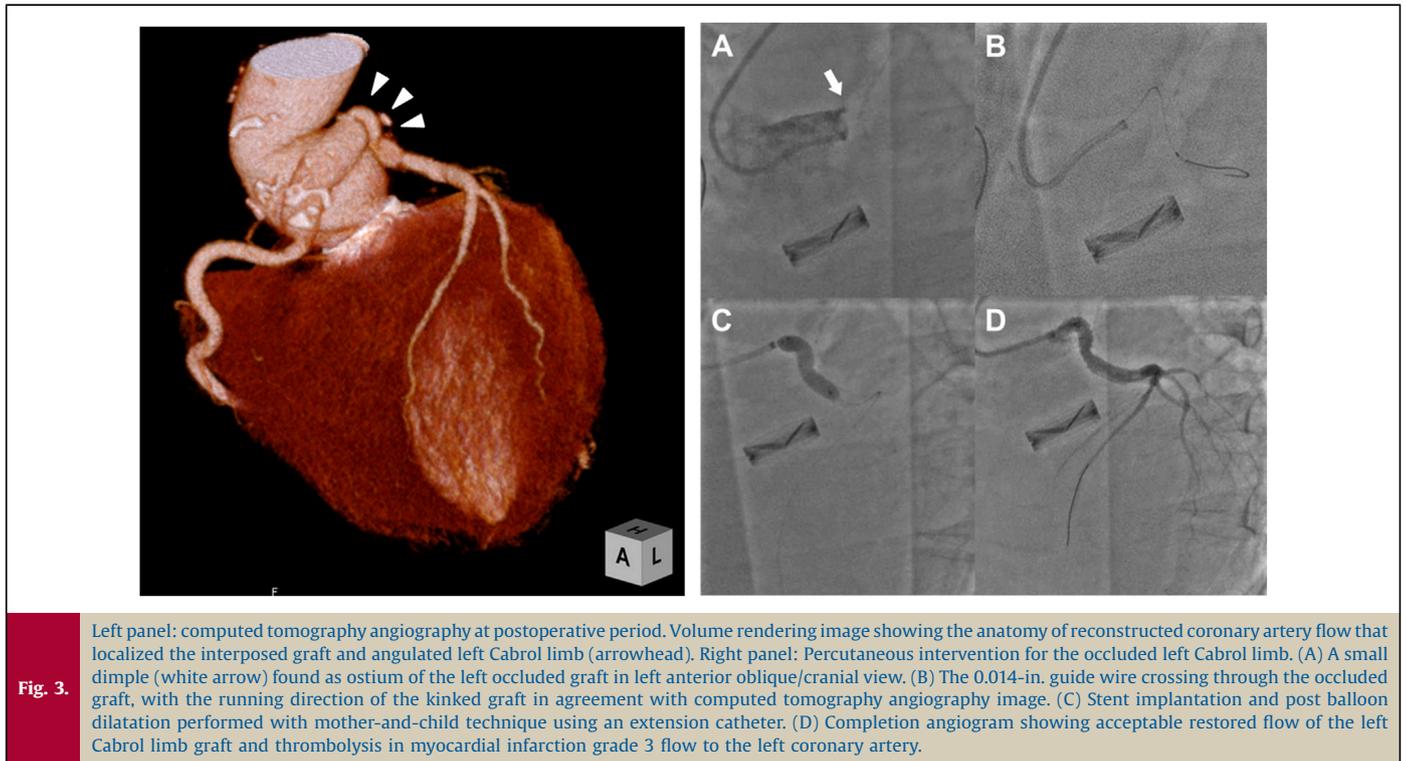


postoperative computed tomography angiography (CTA) (Fig. 3, left panel). With information from the CTA, the procedure was initiated. During angiography, a 6 Fr standard Amplatz Left 1 catheter successfully engaged the interposed Dacron graft. A dimple could be faintly located at an estimated position of left Cabrol limb ostia in left anterior oblique/cranial view (Fig. 3, right panel A). We advanced a 0.014-in. hydrophilic wire into the dimple and passed through the angulated left Cabrol limb under the guidance of the CTA image (Fig. 3, right panel B). Angiogram showed thrombosed left limb graft and normal left coronary artery. We decided to place a stent in the angulated graft to serve as a mechanical scaffold and eliminate distortion. A 4.0-mm drug-eluting stent (DES) (Synergy, Boston Scientific, Natick, MA, USA) was deployed. However, the 4.0-mm diameter of the stent was evidently undersized for 8.0-mm diameter Dacron graft. A 6.0-mm balloon (Emerge, Boston Scientific) was used for further dilation, although it seemed to be inadequate (Fig. 3, right panel C). Complexity of reconstruction of aortic root and coronary arteries

hampered deployment of further profile devices and manipulation of catheters for intravascular assessment. Angiograms showed acceptable restored flow of the left Cabrol limb graft and left coronary artery (Fig. 3, right panel D), and the patient's hemodynamic status stabilized. After the procedure, he was transferred to the intensive care unit on inotropes and ventilation. Fortunately, no other cardiac complications developed, except heart failure with low ejection fraction. Follow-up angiography at 12 months showed the patent graft or thrombolysis in myocardial infarction (TIMI) grade 3 flow of left coronary artery. During a two-year follow-up period, there was no evidence of any ischemic episode.

Discussion

We report a case of successful percutaneous revascularization through an occluded Cabrol graft in a patient with STEMI and cardiogenic shock. The previous Cabrol procedure complicated the



percutaneous approach for diagnostic angiography and intervention. In our case, CTA performed in his operative period was significantly informative for successful percutaneous procedure. Based on CTA assessment, we were able to promptly obtain an accurate diagnostic angiogram that showed a small dimple as ostium of occluded graft. The guide wire was able to cross through the occluded graft, with the running direction of the kinked graft in agreement with the CTA image. In our case, CTA provided crucial information but also the operative note or the schema might be also important and referable. If CTA was not available, even with non-contrast CT, we could find the location of graft, its attachment point, and the ostia of graft limb. Nevertheless, when percutaneous revascularization could not be achieved without the anatomical information, surgical revascularization should be considered under mechanical circulatory support (MCS).

An acute occlusion of the graft of left Cabrol limb may be equivalent to an occlusion of the left main trunk, which can be catastrophic and requires prompt restored coronary flows. Therefore, urgent percutaneous revascularization becomes necessary in such a hemodynamically unstable patient. MCS device might be also mandatory to stabilization of hemodynamics or multi organ protection. It is imperative to salvage the patient's life, if necessary, followed by staged CABG.

Both acute and late complications of the Cabrol type procedure have been investigated and described. These lesions of ischemic complications associated with a Cabrol graft have usually been managed surgically because the complex anatomy and its size in diameter, usually 8 mm, is considered unsuitable for common coronary stent implantation [2,3]. In the present case, therefore, we selected the Synergy stent because this stent is one of contemporary DESs which have overexpansion capacity post large size balloon dilatation. Several cases of percutaneous intervention for Cabrol grafts have been reported, but the long-term outcomes have been unclear [4–8]. Moreover, procedural strategy, including thrombus aspiration or stent implantation, varied depending on the etiologies of the occlusive lesions. There have been few reported cases of successful percutaneous approach to delayed

complications of the Cabrol procedure. Our case suggested that kinking and angulated graft could produce sluggish flow and turbulence leading to occlusion of the graft with thrombus [6,9,10]. In addition, his PT-INR was relatively low of 1.71 that was prone to thrombus formation. Therefore, we selected a stent implantation into a graft to serve as a scaffold for eliminating distortion of the kinked graft. This was followed by sufficient anticoagulation therapy of warfarin needed to maintain the INR within a target range of 2–3, while the stent, although post-dilated, was undersized for the graft. In our case, the percutaneous approach for this patient provided an improved short-term outcome under life-threatening conditions and remained durable in the two-year follow-up period.

Conclusion

We successfully performed percutaneous intervention for an occluded Cabrol graft after assessment of its configuration from CTA. In surgical coronary artery reconstruction, CTA may be extremely useful for recognition of its complex anatomy to achieve accurate diagnostic angiography and percutaneous intervention. In addition, knowledge of various surgical techniques, including a Cabrol procedure, should be required for interventional cardiologists because they may encounter a patient who needs urgent percutaneous revascularization for surgical coronary reconstruction.

Conflict of interest

Author has no conflict of interests.

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