

## Myocardial Revascularization in Two Patients Associated with Antiphospholipid Syndrome: Different Pathogenic Patterns and Angiographic Results

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We report on two women who underwent myocardial revascularization associated with antiphospholipid syndrome (APS) with different pathogenic patterns. The first woman presented with acute myocardial infarction, and pre-operative angiograms demonstrated rapidly progressing coronary lesions, presumptive unstable plaque, and dissection. Operative findings, however, showed fresh thrombi in the coronary arteries, and she was diagnosed postoperatively as having APS. Her one-year angiogram demonstrated improved coronary lesions and a competitive flow pattern in the grafts. The second woman presented with unstable angina and had been treated for systemic lupus erythematosus and secondary APS for more than 14 years. She underwent myocardial revascularization due to accelerated coronary atherosclerosis. Her one-year angiogram demonstrated patent grafts.

Key words: 1. Coronary artery bypass surgery  
2. Off-pump  
3. Thrombosis

### CASE REPORT

#### 1) Case 1

A 48-year-old previously healthy woman visited our emergency department due to intractable substernal chest pain. Laboratory tests showed elevated serum cardiac enzymes, which indicated non-ST elevation myocardial infarction (creatinine kinase-MB=14.8 ng/mL, Troponin I=3.44 ng/mL). She had no risk factors for coronary artery disease including a history of smoking, diabetes mellitus, hypertension, and dyslipidemia. She did not have a family history of coronary

artery disease or gestational morbidity. She had visited another hospital due to chest pain 8 days before admission to our institution. A diagnosis of unstable angina was made and a coronary angiogram was performed, which revealed coronary artery lesions involving the left anterior descending (LAD), diagonal, and ramus intermedius coronary arteries (Fig. 1A). Her intractable chest pain persisted despite medical treatment including aspirin and the continuous infusion of heparin and nitroglycerin by our emergency department. A coronary angiogram was performed again and demonstrated aggravated coronary lesions (Fig. 1B) and multiple luminal narrowings

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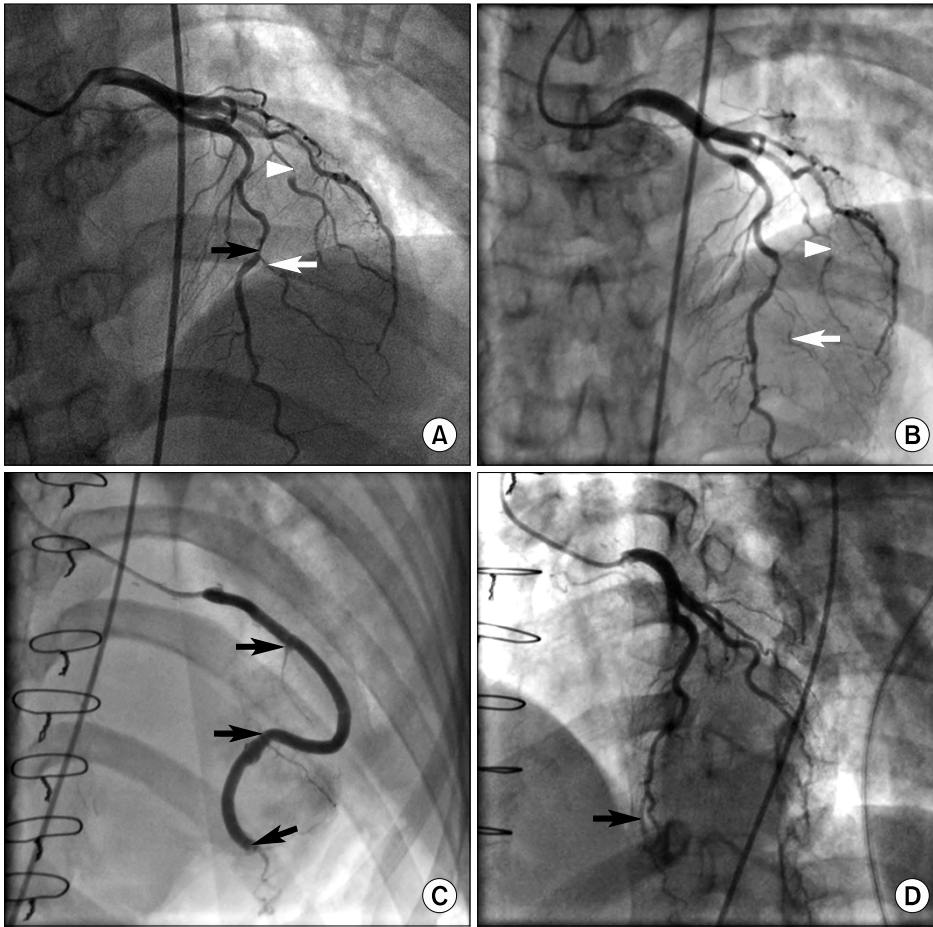
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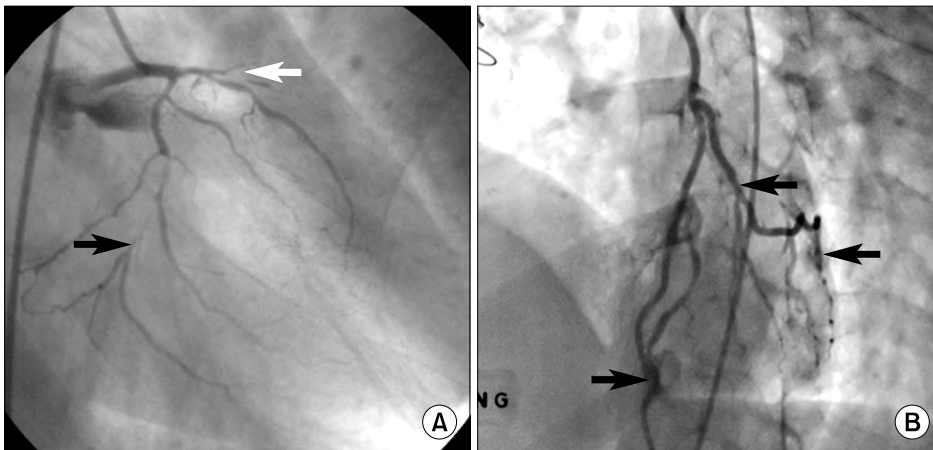
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**Fig. 1.** (Case 1) An initial coronary angiogram revealed coronary lesions in the left anterior descending (LAD, black arrow), diagonal (white arrow), and ramus intermedius coronary arteries (arrow head) (A). A follow-up angiogram taken 8 days later showed aggravated coronary lesions particularly in the diagonal (white arrow) and ramus intermedius coronary arteries (arrow head) (B). An early postoperative angiogram showed patent distal anastomoses (black arrows) (C). A one-year angiogram demonstrated completely resolved LAD lesions and retrograde visualization of the saphenous vein graft from the LAD, suggesting a competitive flow pattern (black arrow) (D).

even in the left internal thoracic artery (ITA). Because of the intractable chest pain associated with the rapidly progressing nature of the coronary lesions, the patient was referred for urgent myocardial revascularization. She underwent off-pump coronary artery bypass (OPCAB) using a skeletonized right ITA graft as a blood source. The patient was given an initial dose of heparin (1.5 mg/kg) and periodically received supplemental doses to maintain an activated clotting time longer than 250 seconds during OPCAB. Because her skeletonized right ITA was too short to reach the target left coronary arteries, a segment of the reversed saphenous vein was anastomosed to the end of the right ITA in an I-fashion and grafted to the diagonal and LAD coronary arteries, and the ramus intermedius using a sequential grafting technique. Upon opening the coronary arteries, the lumen was almost completely filled with diffuse fresh thrombi. When the fresh thrombi were removed through the coronary arteriotomies, neither cor-

onary artery dissection nor atherosclerotic plaque was found. Protamine was not given at the end of the procedure. The patient was heparinized in the intensive care unit to maintain an activated clotting time longer than 150 seconds, and anticoagulation therapy using warfarin and aspirin was started at 1 day postoperatively. A angiogram performed 2 days postoperatively demonstrated patent grafts (Fig. 1C). Under a suspicion of thrombotic disorder, laboratory markers such as lupus anticoagulant, anticardiolipin antibody, anti-beta2Gp1 antibody, complement 3, complement 4, and fluorescent anti-nuclear antibody, were evaluated postoperatively. She was diagnosed with APS after a positive result for lupus anticoagulant. She was discharged on the 6th postoperative day on warfarin and aspirin. A 1-year postoperative angiogram was performed and demonstrated completely resolved LAD lesions, a patent graft to the ramus intermedius and diagonal coronary arteries, and a competitive flow pattern in the graft



**Fig. 2.** (Case 2) A preoperative coronary angiogram demonstrated totally occluded left anterior descending (LAD, white arrow) and stenotic obtuse marginal (black arrow) coronary arteries (A). A one-year postoperative angiogram demonstrated a patent Y-composite graft to the coronary arteries (black arrows) (B).

to the LAD coronary artery (Fig. 1D).

## 2) Case 2

A 36-year-old woman with a 6-month history of chest pain visited our hospital due to chest pain of increasing frequency. She had been diagnosed as having systemic lupus erythematosus (SLE) at the age of 20, and had been treated with corticosteroids. Secondary APS manifested as recurrent abortion, an episode of acute pulmonary thromboembolism developed 2 years after the diagnosis of SLE, and anticoagulation therapy was added. Her family history included an acute myocardial infarction in her elder brother at the age of 34 years. Her electrocardiogram and serum level of cardiac enzymes were normal; however, she did have a positive treadmill test. A preoperative coronary angiogram demonstrated a completely occluded proximal LAD coronary artery and multiple stenotic lesions in the obtuse marginal coronary artery (Fig. 2A). She underwent OPCAB using skeletonized bilateral ITA grafts. The right ITA was divided at the proximal section and was anastomosed in a Y-fashion to the side of the left ITA. The left ITA was anastomosed to the LAD coronary artery, and the right ITA was anastomosed to the diagonal and obtuse marginal coronary arteries in a sequential fashion. An early angiogram performed on the 1st postoperative day revealed all patent grafts. She was discharged on the 7th postoperative day on warfarin and aspirin. A 1-year postoperative angiogram was performed and demonstrated that all grafts remained patent (Fig. 2B).

## DISCUSSION

APS is a clinical syndrome associated with antibodies against phospholipids, and it manifests as systemic thrombotic disorders including recurrent deep vein thrombosis, pulmonary thromboembolism, brain stroke, and recurrent fetal loss due to placental thrombosis [1,2]. A diagnosis is made based on at least one of the clinical features--vascular thrombosis and/or pregnancy morbidity, and one of the laboratory criteria, which are lupus anticoagulant and/or anticardiolipin antibody. Primary APS means that APS occurs in the absence of other systemic autoimmune disorders. Otherwise, secondary APS is associated with an autoimmune disorder such as SLE [3]. Coronary events have been reported to occur in approximately 5% of APS patients, particularly those under age 45 [4]. They are usually associated with accelerated atherosclerosis resulting from long-term steroid therapy, dyslipidemia, and hypertension [5,6]. In addition, the presence of antiphospholipid antibody is regarded as an independent risk factor for premature atherosclerosis [4,5]. Coronary events tend to occur secondary to other thrombotic events [7]. In Case 1, the patient previously had neither risk factors of coronary artery disease nor clinical signs of APS. Diffuse coronary thrombosis imitating atherosclerotic coronary artery disease allowed us to perform myocardial revascularization, like to a previous report of a patient with APS and coronary atherosclerosis [8]. We diagnosed the case 1 patient with APS postoperatively from the intraoperative finding of diffuse coronary artery thrombosis and positive lupus anticoagulant activity.

On the other hand, the second patient was previously followed for secondary APS. Severe atherosclerotic stenosis occurred in her left coronary artery territories despite long-term steroid and anticoagulation therapy. In addition to the effect of APS on progressive atherosclerosis, SLE-induced myocardial microvasculopathy may have affected the pathogenesis of the Case 2 patient [2].

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