CASE REPORT

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Closure of Coronary Artery Fistula with Covered Stent and Correction of Stenosed Left Anterior Descending Artery in the Same Procedure

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ABSTRACT

We report a case of closure of the coronary artery fistula with polytetrafluoroethylene (PTFE)-covered stent at the proximal left anterior descending artery along with simultaneous stenting at the stenosed middle segment of the left anterior descending artery. The successful experience proved that this kind of stent is a feasible and safe supplement to catheter-based devices in treating coronary artery fistula, although further evaluation is needed.
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KEY WORDS : Coronary vessels; Vascular fistula; Stents; Angioplasty, transluminal, percutaneous coronary.

Introduction

Coronary artery fistula (CAF) is a rare coronary artery anomaly characterized by aberrant communications between the coronary arteries and the cardiac chambers, pulmonary artery, pulmonary vein, coronary sinus, or vena cava.[1)] The causes of CAF are mostly congenital ; other causes are traumatic and iatrogenic.[2)] For those with congenital CAF, symptoms or complications often appear during or after the second decade of life,[3)] however, asymptomatic patients still comprise about half of this group[4)] CAF can be managed with surgical treatment and catheter-based occlusion. The catheter-based techniques usually use coils, detachable balloons, umbrella devices, and polyvinyl alcohol foam to occlude CAF in the current practice.[2)] With the advent of the covered stent, a new option is available in the cardiac catheterization laboratory. We report a case of successful closure of CAF with polytetrafluoroethylene (PTFE)-covered stent and the simultaneous correction of stenosed left anterior descending (LAD) artery with noncovered stent.

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Case

A 50-year-old woman complained of effort-related chest pain for several months. Each episode usually lasted 5 to 10 minutes and was relieved by rest or by sublingual usage of nitroglycerin. She had a history of diabetes mellitus for two years and had been treated with an oral hypoglycemic agent. Her blood pressure was within normal limits and no specific signs were found on her physical examination. Her chest roentgenogram was normal, and electrocardiography showed normal sinus rhythm with T wave inversion in the precordial leads. Thallium scanning revealed a moderately decreased perfusion defect in the anterior wall of the heart. Subsequent angiogram showed a diffuse long

lesion proximal to the middle part of the LAD with 60% to 70% diameter stenosis and a CAF originating from a tortuous septal branch of the proximal LAD, finally draining to the main pulmonary artery (Figure 1A).

We decided to stent at the middle portion of the LAD and simultaneously occlude the CAF. The procedure was performed with intravascular ultrasound (IVUS) guidance. After predilation of the target lesion using a conventional balloon catheter, we deployed a 3.0 mm × 20 mm noncovered stent (Tsunami®, Terumo Corp., Tokyo, Japan) into the middle part of the LAD. Then, another 3.0 mm × 16 mm PTFE covered stent (JOSTENT® Coronary Stent Graft Supreme System, JOMED GmbH, Rangendingen, Germany) was deployed into the proximal portion of the LAD to seal the ostium of the septal branch supplying the fistula and to prevent the narrowing at this site. Adjunctive high pressure dilatation was subsequently performed to maximize the lumen diameter. No residual fistula and shunt flow was found on the final angiographic image (Figure 1B). Post-stent IVUS studying showed a large cross sectional area proximal to the middle portion of the LAD. The covered stent was well positioned and fully covered the septal branch providing the fistula (Figure 2B). The antiplatelet regimens included aspirin 200 mg (permanent) and clopidogrel 75 mg daily for 4 weeks (started 2 days before procedure). Three days after the procedure, the patient was discharged without any complications, and the clinical follow-up was planned.

Discussion

The reported incidence of CAF in patients undergoing catheterization examination is 0.1% to 0.2%.[1] Surgical treatment was the first successful modality applied to this entity[5] and remains the standard method against which any other new technique is compared. With the development of interventional technology, transcatheter techniques have been employed in this field since 1983.[6] In a recent review, Armsby et al.[3] reported the catheter-based closure of CAF with an 83% procedural success rate in which 91% of the patients maintained complete closure during follow-up periods (1 day to 4 years). Although transcatheter closure has been advocated as a minimally invasive alternative for treating CAF, it is by no means without risk. Reported complications include transient electrocardiographic changes, myocardial infarction, fistula dissection, and pulmonary or epicardial coronary artery embolization.[1)3)5)]

The appearance of covered stent further diversified the treatment strategies for CAF. The covered stent, initially used in the field of peripheral intervention, was introduced to the coronary artery tree for its effec-

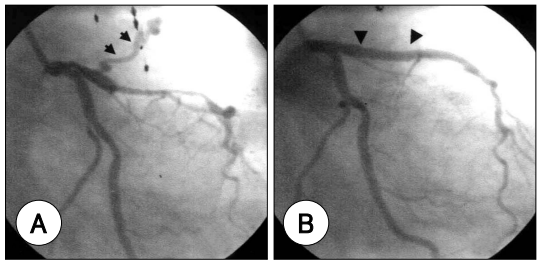

Figure 1. A: the coronary angiogram in the anterior-posterior caudal oblique projection shows the coronary fistula (arrows) originating from the tortuous septal branch of LAD and pass anteriorly to the main pulmonary artery, and at the proximal to middle part of the LAD, there is a long diffuse narrowing (60% to 70% diameter stenosis), B: the final angiogram shows complete closure of the coronary fistula (arrow heads) with the JOSTENT® coronary stent graft, no residual shunt exists, and the final lumen of LAD is satisfactory without residual stenosis. LAD: left anterior descending coronary artery.

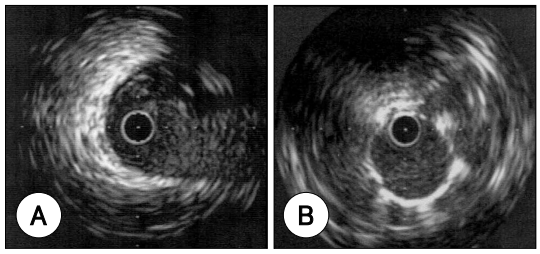

Figure 2. A: the IVUS image at the originating site of CAF before the implantation of the covered stent, B: the final IVUS image at the same site as in Fig A. The ostium of the feeding branch was jailed by the covered stent and obvious acoustic shadowing beneath the stent can be seen. CAF: coronary artery, IVUS: intravascular ultrasonography.

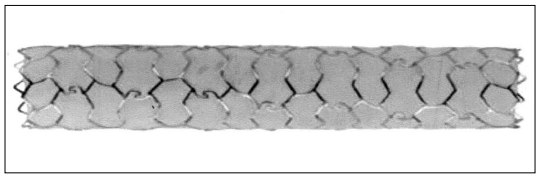

Figure 3. JOSTENT® coronary stent graft.

tiveness in some bail-out situations such as vascular perforation,[7] and recently, there has been a trend to extend its indications.[8)10)] However, the application of covered stent to close CAF is limited and can only be seen in a few case reports.[1)9)]

In our case, the covered stent used was JOSTENT® coronary stent graft supreme system (JOMED GmbH, Rangendingen, Germany), which has expandable, biocompatible PTFE graft material sandwiched between two stainless steel stents (Figure 3). In two previous studies,[8)10)] where these stents had been tested in various clinical settings, the primary success rate was high-achieving 95.9% in one series -with good procedural safety. The follow-up data showed promising results in vein graft lesions, which will probably be corroborated in two ongoing randomized trials (STING, RECOVERS). However, the results in native coronary artery lesions were somewhat disappointing. The restenosis rate of covered stent was not superior to conventional non-covered stent probably because its failure to limit neointimal hyperplasia at the stent edges. The complications of implantation mainly include side-branch occlusion and relatively higher incidence of stent thrombosis. The former is an important limitation of the covered stent when used in native coronary artery diseases, which usually cause non-Q-wave myocardial infarction and even acute Q-wave infarction if a large side branch is closed. The latter might be attributable for the delayed endothelialization of the stent surface, which warrants intensive antiplatelet regimens.[8)]

For the special design of covered stent, meticulousness is required in the selection of patients. The coronary artery of our patient was anatomically suitable for the use of the covered stent because there was no big side branch adjacent to the CAF and the lesion site lied in the proximal LAD without tortuous segments prior to it, which otherwise might prevent the relative bulky stent from arriving at the target lesion. Furthermore, the stenosis around the originating site of the fistula, which is considered to enhance the coronary steal phenomenon, could be treated simultaneously without additional manipulation and devices.

Compared with coil embolization, using covered stent to treat CAF was technically easier and more time-saving, and it did not require the fistula to be cannulated and wired. In addition, there were no concerns over multiple drainage sites, tortuosity of the feeding vessel, angulation of the fistula ostium, and pulmonary artery embolization. For an experienced coronary intervention operator, there is nearly no difference from the conventional stent implantation, such that a specific training process is not required. Nonetheless, considering the in-stent restenosis, which might be more formidable than the fistula, we still don't know whether our patient can keep benefiting from this new strategy for a long period.

In summary, our initial experience with JOSTENT® coronary stent graft supreme system made us feel that implantation of the covered stent was a feasible and safe alternative for treating CAF in selected patients. However, the long-term outcome of this new design remains unclear and further evaluation is needed.

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