Hybrid Epicardial and Endocardial Catheter Ablation in a Patient With Atrial Fibrillation and Suspicious Left Atrial Thrombus

Jong-II Choi, MD, PhD; Hui-Nam Pak, MD, PhD; Young-Hoon Kim, MD, PhD

Patients with a left atrial (LA) thrombus are considered at risk of a serious thromboembolic event, and therefore endocardial radiofrequency catheter ablation (RFCA) of atrial fibrillation (AF) is contraindicated. However, RFCA of AF is inevitable in some patients with highly symptomatic AF and suspicious LA masses resembling thrombus. A patient was treated who underwent hybrid epicardial and endocardial RFCA for drug resistant, highly symptomatic, paroxysmal AF with a suspicious left atrial (LA) thrombus that was a lamellated, thickened, echogenic lesion attached to the LA anterior wall and resistant to anticoagulation. During RFCA, contact with the LA endocardium was minimized using hybrid epicardial and endocardial ablation guided by computed tomography merged with 3-dimensional electroanatomical mapping (NavX). The patient has been free of AF without antiarrhythmic drugs for 6 months, therefore hybrid epicardial and endocardial ablation may be an effective therapy for AF patients with a LA mass. (Circ J 2009; 73: 384–387)

Key Words: Atrial fibrillation; Catheter ablation; Epicardium; Left atrium; Thrombus

Patients with atrial fibrillation (AF) have a 6–10% annual risk of ischemic stroke, and a left atrial (LA) thrombus is a known contraindication for cardioversion or endocardial radiofrequency catheter ablation (RFCA) of AF. Moreover, endocardial AF ablation itself has a 1% risk of ischemic stroke, usually within 3–6 months, even with appropriate anticoagulation medication. Recently, we reported the effectiveness and feasibility of percutaneous epicardial catheter ablation (PECA) of AF as an adjunct to endocardial ablation! The ideal candidates for a PECA of AF are patients who need redo-ablation procedures with a high risk for left-sided pulmonary vein (PV) stenosis, and those with a history of a failed endocardial ablation, because the epicardial tissue at the junction between the LA appendage and the left-side PV are covered with a myocardial layer unlike PV itself. Other candidates for PECA are those requiring a difficult transseptal puncture during redo-procedure. We treated a patient with AF and a LA mural mass, who underwent hybrid PECA and endocardial ablation to avoid thromboembolism, and we propose a suspicious LA mass as one more indication for PECA.

Case Report

A 72-year-old male patient had been suffering from recurrent episodes of paroxysmal AF resistant to flecainide and propafenone for 7 months. He had a history of right-middle cerebral arterial infarction 7 months previously during chemotherapy, following subtotal gastrectomy due to advanced gastric cancer. He had been taking warfarin after the stroke. In spite of rate control and anti-arrhythmic drugs, AF occurred more often and lasted longer (>3 days), and the patient was highly symptomatic and became very anxious and eager to undergo RFCA. Echocardiography showed that the patient had a structurally normal heart with a left ventricular ejection fraction of 60% and LA diameter of 38.3 mm. However, transesophageal echocardiography performed prior to RFCA revealed a thick and echogenic lining, 4–5 mm thick, with an irregular margin (Fig 1A) and a 2 mm-sized mobile mass on the anterior wall of LA. Because we could not exclude the possibility of lamellated mural thrombus, we postponed RFCA and maintained strict anticoagulation therapy for 3 additional months (total of 10 months of optimal anticoagulation). In the follow-up transesophageal echocardiogram, the LA mass on the anterior wall was unchanged (Fig 1B). Computed tomography (CT) showed a low density focal lesion on the anterior wall of LA, at the level of bilateral superior PV. This lesion was partly enhanced and had a slightly irregular surface (Figs 1C, D) so the possibility of LA thrombus could not be excluded. The LA mural mass was localized on the LA anterior wall compared to the fossa ovalis. The patient’s AF became persistent despite anti-arrhythmic drugs, and he was highly symptomatic, nervous and desperate for RFCA. Therefore, we considered epicardial ablation of LA as a therapeutic option to minimize touching the LA endocardial surface and reduce the risk of thromboembolism during the procedure. After complete explanation of the risks and benefits of AF ablation was given to the patient and his family members, and informed consent was obtained. Three-dimensional mapping (NavX, St. Jude Medical Inc, Minnetonka, MN, USA) guided AF ablation was performed as previously described! We kept the patient on warfarin until the day of RF ablation because of the thromboembolic risk. Heparin was administered after transseptal puncture and during the procedure, an activated clotting time was
maintained between 350 and 400 s. We generated 3-dimensional (3D) geometries of 4 PVs, trying not to touch the LA anterior wall near the mural mass lesion (Fig 2A). The 3D CT image was then merged and referenced to the 4 preformed PVs (Fig 2B). We first performed endocardial ablation on the right-side antrum of the LA as quickly as possible to minimize the duration of LA catheter insertion, and confirmed the electrical isolation of PV potentials in both right superior and inferior PVs. AF was terminated during right-side antral ablation. For left-side PV isolations, we performed PECA to avoid touching the LA anterior wall during ablation. Percutaneous pericardial puncture was performed by a subxiphoid approach, and then a long sheath (Schwartz Left 1 sheath, St. Jude Medical Inc, Minnetonka, MN, USA) was introduced into the pericardial space along the left-side atrioventricular groove to the junction between the LA appendage and the anterior border of left-side PVs. The long sheath was preferred because its position for catheter handling was almost parallel to that of another long sheath in the right groin. We advanced the ablation catheter guided by a CT-merged NavX 3D map and fluoroscopic RAO view, anteriorly to the ring catheter in the left-side PV (Figs 2C,D). For RF ablation, we used an open irrigated-tip catheter (35 W, 50°C, 20–30 ml/min, Celsius Johnson & Johnson Inc, Diamond Bar, CA, USA) and delivered RF energy for 40 s at each point, monitoring the reduction of the voltage of the electrogram. PECA was started from the left side of the LA roof and the catheter was dragged down with continuous ablation to the junction between the LA appendage and left-side PVs, then all the way to the left lateral isthmus where the Marshall ligament was located (Fig 3A). Because this patient did not have a long-lasting chronic AF with enlarged LA, a complete bidirectional block of the left lateral isthmus was not achieved. We did not ablate the left lateral isthmus <10 mm closer to the coronary sinus catheter to avoid the injury of the circumflex coronary artery. We monitored the intraarterial blood pressure to avoid pericardial tamponade induced by the saline from open irrigation tip catheter. However, PECA was finished within 10 min, and we did...
not need to interrupt ablation for pericardial fluid drainage. During PECA between left-side PVs and the LA appendage, potentials of the left inferior PV were eliminated by the anterior side linear continuous lesion (Fig 3B). To eliminate the remaining potentials in the left superior PV, we carefully performed touch-up ablation endocardially at the junction between the left superior and inferior PVs (Fig 3C), matching endo- and epi-line using a 3D electro-anatomical map and confirming continuity of the lines using antral potential monitoring, and the potentials in the left superior PV were completely eliminated during the fifth ablation (Fig 3D). After right-side antral ablation, left anterior PV PECA and left endocardial touch-up ablation, we finished the procedure. AF was not inducible using aggressive atrial pacing (pacing cycle length 200–150 ms with 10 mA), and immediate recurrence of AF after cardioversion (5J) no longer occurred with intravenous isoproterenol (3 μg/min).

Steroids were administered to avoid post-PECA pericarditis, and the pericardial catheter was removed 12 h after PECA, noting the amount of serous pericardial drainage. The patient was discharged without any complications. The patient has been taking warfarin and has been free of AF without the use of antiarrhythmic drugs for 6 months.

**Discussion**

We treated a patient with AF and a LA mural mass, who underwent hybrid epi- and endocardial ablation successfully. PECA may be considered as a therapeutic option to minimize touching the LA endocardial surface in patients with AF, LA mass and a risk of thromboembolism.

Transesophageal echocardiography remains the gold standard for non-invasive assessment of an intracardiac mass. However, if the attachment site of the LA mass is not clearly identified through echocardiography, it becomes difficult to differentiate intracardiac masses, such as tumors and thrombi. A mass located in the LA can be defined as a thrombus if it is associated with the presence of AF, enlarged atrial chamber, prosthetic mechanical valves, stenotic mitral or tricuspid valves or a low cardiac output state with spontaneous echo contrast in the atria. LA thrombi are classically found in atrial appendages, but can also be found in the body of the atrium. In the present case, the presence of spontaneous echo contrast in the LA, together with a history of paroxysmal AF, favored the diagnosis of atrial thrombus. The morphology of the mass in the CT image also suggested thrombus. However, its unusual location, absence of any additional mass in the LA appendage, lamellated contour and unresponsiveness to 10 months’ optimal anticoagulation did not suggest the possibility of LA mural thrombus. LA thrombi treated with 4–8 weeks of optimal anticoagulation have a reported resolution rate of about 80%. Therefore, a thrombus mimicking lesions, such as tumors, vegetation and fibroeleastosis, should be...
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considered when a suspicious LA thrombus is not resolved by sufficient anticoagulation. However, differential diagnosis may be difficult in some cases, and a thrombus may be formed and superimposed onto the structure. Regardless of its pathology, a LA mural mass still has a risk of embolism, and hybrid epicardial and endocardial AF ablation was appropriate for this specific patient.

An ablation catheter is manipulated throughout the LA during an AF ablation procedure, and dislodging an in situ thrombus would result in a thromboembolic complication. Therefore, careful attention to anticoagulation of patients before, during, and after ablation for AF is critical to avoid the occurrence of a thromboembolic event, which is recognized as one of the most common complications of AF ablation procedures. Warfarin therapy is usually started at least 2 months before an AF ablation, and is recommended for all patients for at least 2 months following the procedure. Recently, we proposed a hybrid epicardial and endocardial ablation for AF as an effective ablation technique for difficult cases, such as previously failed endocardial ablation procedure, high risk of left-sided PV stenosis, a case of difficult transseptal puncture during redo-procedure and a high risk of thromboembolism. Therefore, we applied hybrid PECA and an endocardial approach to minimize touching the LA endocardium and the risk of thromboembolism in this patient. However, endocardial contact and ablation were inevitable, because the right-side PV cannot be ablated epicardially, and the epicardial ablation of left-side PV was incomplete and required several touch-up endocardial ablations at the anterior carina area. Although this new approach resulted in a successful outcome for this patient, the risk of complications such as hemopericardium, phrenic nerve injury, great vessel injury, coronary artery damage or pericarditis should also be considered in detail before the procedure.

In conclusion, hybrid PECA and endocardial ablation may be considered a useful therapeutic option in AF patients who have an LA mural mass that mimics thrombotic lesion but does not resolve after sufficient and optimal anticoagulation.

References