ilized, making it impossible to use a low-porosity graft. A thin-wall prosthesis might cause late aneurysm expansion associated with persistent or recurrent pressurization of the excluded aneurysm (endotension).⁴ Our method has 2 advantages over theirs. First, the stent graft can be easily prepared intraoperatively, and second, use of a low-porosity graft might prevent endotension. Insertion is not as smooth as with a sheathed stent graft, but winding the graft with polypropylene solved this problem.

The circulatory arrest time was somewhat longer in the patients with postoperative paraplegia (66 minutes) than in the patients with no postoperative complications (51 and 49 minutes for each), but its duration might not be a concern during such deep hypothermia. Careful maneuvering of the stent graft is important in this operation to prevent obstruction of the Adamkiewicz artery or cholesterol emboli in the anterior spinal artery,⁵ especially with a history of abdominal aortic aneurysm repair.

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Video-assisted transseptal cryoablation of left atrium in nonmitral cases

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The maze procedure, originated by Cox and colleagues,^{1,2} has become the criterion standard for the surgical treatment of chronic or paroxysmal atrial fibrillation. In this procedure, both atria are electrically separated into small compartments by atriotomy and cryoablation to prevent electrical macro reentry at each compartment, and a conduction from the sinus node to the atrioventricular node is preserved. In the usual left atrial (LA) maze procedure, endocardial cryoablation is performed directly through a right-sided left atriotomy, which is created anterior to the pulmonary veins (PVs).

In a limited number of patients in whom the mitral valve was left untouched, a video-assisted minicardioscopic approach through a small cut in the fossa ovalis or a congenital atrial septal defect (ASD) was used instead of a direct left atriotomy approach. This report describes the method and clinical outcomes of this technique.

Patients and Method

This technique was applied to 3 consecutive male patients with chronic atrial fibrillation and concomitant nonmitral cardiac diseases: ASD (secundum type), severe tricuspid regurgitation (TR) resulting from previous endocarditis, and coronary artery disease (CAD). The durations of arrhythmia were 10 months, 1 year, and 3 years, respectively, and the sizes of the LA on longitudinal echocardiographic view were 52, 54, and 50 mm, respectively. The fibrillation waves were greater than 1 mV in the V₁ electrocardiographic lead in each case. Although preoperative electrophysiologic tests were not available for any of the patients, a maze procedure was performed concomitantly. A 3-mm diameter, 30° rigid endoscope (Karl Storz GmbH & Co, Tuttlingen, Germany), and T-shaped and straight cryoablation probes (CooperSurgical, Inc, Shelton, Conn) were used.

Cardiopulmonary bypass was established with bicaval drainage and LA venting through the right upper PV. In the TR and CAD cases, bicaval occlusion was performed, and the Kosakai procedure,³ a modified maze procedure that uses incisions and cryoablation, was performed for the right atrium. Thereafter an aortic crossclamp was placed and cardiac arrest was performed, and the T-shaped cryoablation probe and cardioscope were introduced into the LA through a 1-cm cut at the fossa ovalis or ASD. The anatomy of the LA, including the ostia of each PV and the LA appendage (LAA), was precisely identified videoscopically, and videocardioscopic endocardial cryoablation was performed (Figure 1). Cryolesions were created around the four PVs, between the PV-encircling cryoablation and the midst of the posterior mitral valvular annulus, and between the PV-encircling lesion and the base of the LAA. Finally, the cryoablation between the PV-encircling lesion and the septotomy or ASD was created with the

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Figure 1. Transseptal cardioscopic view of LA, showing activated T-shaped cryoablation probe (arrow), left upper (U) and lower (L) PVs, mitral valve (M), and LAA.

straight cryoprobe. Each cryoablation was 2-minutes long, and the temperature was -75°C . Thereafter the septotomy or ASD was closed, the LAA was excised and closed, the LA was deaired, and the aorta was declamped. After the LA maze procedure, a right atrial maze procedure was performed in the ASD case, and tricuspid valve plasty and coronary artery bypass grafting were performed in the other 2 cases.

Results

Videocardioscopic LA-endocardial cryoablation required 24, 20, and 22 minutes of aortic crossclamping. No deaths or procedure-related morbidities occurred. After the operation, each patient recovered sinus rhythm. The follow-up periods were 7, 4, and 3 months in the ASD, TR, and CAD cases, respectively. With the oral intake of digoxin (0.25 mg) in the ASD and TR cases and atenolol (25 mg) in the CAD case, all 3 patients have maintained regular sinus rhythm.

Discussion

Cox¹ introduced the original maze procedure in 1991, and his group developed the Cox maze III technique with excellent clinical outcomes.² Today, although different energy sources (laser, microwave, and radiofrequency) have been applied endocardially or epicardially,^{4,5} endocardial cryoablation is still considered the safest and most reliable method with acceptable transmuralty and durability. Kosakai and associates³ developed a modified method in which cardiomyotomies were reduced and cryoablation was used more extensively to minimize hemorrhage from atriotomies and preserve the sinus node artery. Their clinical results, including sinus rhythm recovery, were as good as the outcomes with the Cox method. Although it is limited to nonmitral cases, our cardioscopic technique is actually a modified Kosakai technique³ in which the left atriotomy, except the LAA division, has been eliminated.

The 3-mm cardioscope is the most important tool in the technique described here. This miniscope, which was developed only recently, enables excellent intra-atrial visualization through a small septal entry.

In summary, although our experience is limited, videocardioscopic endocardial left-atrial cryoablation through a small septotomy or ASD is a feasible procedure. It has acceptable results and can be applied to nonmitral cases with atrial fibrillation.

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