Surgical Experience With Right Atrial–Aortic Fistula and Penetration of the Superior Vena Cava by a Protruding Accufix Atrial J-Shaped Retention Wire

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A 57-year-old woman who had a dual chamber pacemaker implanted in June 1990 for sick sinus syndrome had developed heart failure since 1993. Although fluoroscopy revealed that the proximal J-shaped retention wire of the lead had fractured and had protruded through the outer insulation in 1994, and also that the distal J-shaped retention wire of the lead had protruded through the outer insulation in 1997, a transthoracic echocardiographic examination diagnosed tricuspid valve regurgitation, suggesting that the right atrial-aortic fistula might have been overlooked. In an attempt to avoid migration of the J-shaped retention wire from the lead and to repair the tricuspid regurgitation, it was decided that an operation be performed; however, intraoperative transesophageal echocardiography showed a right atrial-aortic fistula. Intraoperative inspection also revealed that the right atrial-aortic fistula and penetration of the superior vena cava had been caused by the Accufix atrial J-shaped retention wire. Under total cardiopulmonary bypass and induced cardiac arrest, a right atriotomy was performed and the atrial and ventricular leads were removed from the tips. The atrial orifice of the fistula and the aortic orifice were closed. Finally, a new dual-chamber pacing system with bipolar epicardial pacing leads was implanted. Postoperative inspection revealed that the proximal retention wire had fractured, the tip of the retention wire had protruded through the outer insulation, and the distal J-shaped outer insulation was damaged. (*Circ J* 2002; 66: 1068–1069)

Key Words: Pacemaker implantation; Retention wire; Right atrial-aortic fistula

The Accufix atrial pacemaker lead was implanted in more than 47,000 patients worldwide between 1988 and 1994. A total of 40 spontaneous injuries that related to the J-retention wire were reported by the Accufix Research Institute on April 1999. Six deaths have been directly attributed to a protruding J-retention wire. In one patient, the J-retention wire was reported to have caused a right atrial-aortic fistula!

After the Accufix pacing leads were recalled in 1994, successful removal of the electrode wires has been attempted. However, extraction of the Accufix leads has been accompanied by significant complications, including 16 deaths among 4023 intravascular procedures (0.4%)!

In the report by the Accufix Multicenter Clinical Study and Worldwide Registry, it is proposed that extraction of a protruded retention wire should be limited to certain cases; that is, where it penetrates through the outer insulation and migrated wire!

Case Report

A 57-year-old woman had a dual chamber pacemaker

implanted in June 1990 for sick sinus syndrome. An Accufix atrial J-lead was inserted in the atrial appendage, while a ventricular lead was inserted in the ventricular apex. These pacing leads were connected to a Pacemaker pulse generator (model 2010T). She was observed every 3 months at the pacemaker clinic in Kansai Medical University. For the entire observation period, the pacemaker was proven to function normally in terms of sensing and pacing. However, since May 1993, the patient had developed dyspnea on exertion, and a heart shadow on X-ray had become larger. On auscultation, a grade 3/6 systolic murmur was heard at the third intercostal space. Transthoracic echocardiography revealed only tricuspid valve regurgitation.

Protrusion of the J-shaped retention wire was first noted in a chest X-ray image taken in June 1994. Cine fluoroscopy revealed that the proximal J-shaped retention wire of the lead was fractured and was protruding through the outer insulation. The patient was followed and chest X-ray images taken at 3-month intervals.

In August 1997, chest X-rays and cine fluoroscopy revealed that the distal J-shaped retention wire of the lead had protruded. Intraoperative transesophageal echocardiography showed a right atrial-aortic fistula (Fig 1). After a median sternotomy, the pericardium was opened. The right atrium was thrilled remarkably, and adhesions were recognized between the pericardium and the superior vena cava and between the ascending aorta and the right atrial appendage. The proximal retention wire was found to have penetrated through the superior vena cava after the adhe-

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Fig 1. Intraoperative transesophageal echocardiography, which shows the right atrial-aortic fistula. LA, left atrium; RA, right atrium; AO, ascending aorta.

sion that had formed between the pericardium and the superior vena cava was dissected.

Only two-thirds of the retention wire was pulled and removed through the superior vena cava. After cardiopulmonary bypass was established with an ascending aortic and bicaval cannulation, the heart was arrested by cross-clamping the ascending aorta, followed by infusion of cardioplegic solution. A right atriotomy was then performed.

The atrial pacing lead was adhered tightly to the superior vena cava and the atrial septum. The protruding tip of the retention wire penetrated the right atrial appendage through the ascending aorta. The orifice of fistula was approximately 7 mm in diameter. The atrial orifice was closed using direct sutures, and the aortic orifice was closed using an interrupted and pledget-supported mattress suture. The atrial and ventricular leads were pulled from the leads' tips and removed. A new dual-chamber pacing system with bipolar epicardial pacing leads was implanted.

Postoperative inspection revealed that the proximal retention wire was fractured, and that the tip of the retention wire had protruded through the outer insulation (Fig 2), and the distal J-shaped outer insulation was damaged. The patient recovered without complications and the postoperative pacemaker functioned normally.

Discussion

Between 1988 and 1994, more than 47,000 patients worldwide had the Accufix atrial pacemaker lead implanted. The Accufix pacing leads were recalled in 1994 after 2 deaths and 2 non-fatal injuries relating to protrusion of the retention wire were reported. A total of 40 spontaneous injuries relating to the Accufix lead have been reported to the worldwide registry.¹ Six deaths have been directly attributed to protruding J-retention wires.

Management of the protruding J-retention wire has been a matter of debate because extraction of the Accufix leads using intravascular procedures has been accompanied by significant morbidity and mortality, including 16 deaths among 4023 intravascular procedures (0.4%).¹ Thus, in the present case, the decision was made after comparing the risk of spontaneous injury with the risk of procedures involving the wire's removal.

In the present case, the heart shadow on X-ray had

Fig 2. Postoperative inspection revealed that the proximal retention wire was fractured (arrow) and the tip of the retention wire was protruding through the outer insulation. The distal J-shaped outer insulation was damaged.

become larger by the third postoperative year. On auscultation, a grade 3/6 systolic murmur was heard at the third intercostal space. Because transthoracic echocardiography showed only tricuspid valve regurgitation, it was considered that heart failure was a result of tricuspid valve regurgitation. It was likely that the fistula of the right atrial appendage to the ascending aorta might have occurred by that time; however, this was overlooked because of poor echocardiographic imaging of the aortic root. Therefore, it was recommended that a transesophageal echocardiography be performed whenever the atrial-aortic fistula was suspected, as transesophageal echocardiography has often been shown to be superior to transthoracic echocardiography.^{2,3}

Despite the patient in the present report having a right atrium to aortic fistula and penetration of the superior vena cava by the retention wire, neither cardiac tamponade nor fatal complications occurred. The absence of cardiac tamponade might be explained by chronic stimulation by the protruding retention wire causing local inflammation and adhesion around the right atrial appendage and ascending aorta.

In conclusion, extruded retention wires may cause penetration to the aorta. This complication can be overlooked as a result of the absence of cardiac tamponade and the failure to detect shunt using transthoracic echocardiography. The present case implies surgical extraction of the retention wire because the proximal J-shaped retention wire of the lead was fractured and had protruded through the outer insulation and the distal J-shaped retention wire of the lead had protruded through the outer insulation. Surgical rather than intravascular procedures are recommended to extract the protruding wire in order to avoid serious complications.

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