Transient Complete Atrioventricular Block Occurring 1 Week After Radiofrequency Ablation for the Treatment of Atrioventricular Nodal Re-Entrant Tachycardia

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Atrioventricular (AV) block following radiofrequency (RF) ablation for the treatment of AV nodal re-entrant tachycardia (AVNRT) is a rare but serious complication of this procedure. Almost all such cases occur during or immediately after radiofrequency (RF) energy application, followed by prompt recovery. The present report describes a 22-year-old woman with first-degree AV block on electrocardiography, who developed complete AV block 1 week after RF ablation for the treatment of the uncommon form of AVNRT (slow/slow). The patient’s complete AV block persisted for another 1 week before she recovered. (Circ J 2002; 66: 1073–1075)

Key Words: Arrhythmia; Atrioventricular block; Complication; Radiofrequency ablation

An electrophysiologic study and RF ablation were performed under mild sedation after first obtaining the patient’s informed consent. Catheters were positioned in the high right atrium, coronary sinus and right ventricular apex, and across the tricuspid valve to record the His bundle potential. At baseline (A–A interval: 825 ms), atrio-His (A-H) and His-ventricular (H-V) intervals were 225 ms and 30 ms, respectively. Using the extrastimulus technique, dual AV nodal physiology was demonstrated with a 140 ms jump in A-H intervals for a 10 ms decrease in coupling interval (S1-S1: 750 ms; S1-S2: 260 ms) (Fig 2A). At a pacing cycle length of 750 ms, the antegrade effective refractory period (ERP) of the AV node was 220 ms. The site of earliest atrial activation potential during ventricular pacing was the coronary sinus ostium (VA: 375 ms; Fig 2B),

Fig1. Electrocardiogram lead II (A) before ablation [first-degree atrioventricular (AV) block]; (B) showing tachycardia with a deeply inverted P wave (heart rate 130 beats/min), and (C) 1 week after ablation (complete AV block).
The patient was well with no recurrence of tachycardia. At follow-up 6 months later, she was asymptomatic with no palpitations. The ECG remained unaffected by treatment with autonomic agents including atropine and propranolol. An ECG showed a complete AV block (Fig. 1C), which did not change with exercise 3 months later. This AV block persisted for 1 year, after which the patient recovered to her earlier condition.

**Discussion**

Atrioventricular nodal re-entrant tachycardia is the most common form of paroxysmal supraventricular tachycardia. Of these patients, the uncommon form of AVNRT, which utilizes the fast pathway for antegrade conduction and the slow pathway for retrograde conduction, has been reported in only 4% of cases. Previous reports have described the efficacy of RF ablation for treating the uncommon form of AVNRT as well as the common form (slow/fast). The reported incidence of AV block after RF ablation in patients with the common form of AVNRT is approximately 1–6%.[5] Recent reports have further demonstrated that the incidence of complete AV block occurs significantly more often in patients who undergo fast pathway ablation than in patients who undergo slow pathway ablation. Of note, almost all cases of AV block occur during or shortly after RF application, are transient, and recover quickly. Persistent AV block is rare and only a few cases require pacemaker implantation. However, little is known about AV block after RF ablation for the treatment of the uncommon form of AVNRT.

The predictor factor for the occurrence of complete AV block during or after ablation is unknown. Fenelon et al reported that 4 of 48 patients (8.3%) who underwent successful slow pathway ablation had transient AV block, and one of 4 patients developed second-degree (Mobitz type I) AV block at rest, developing 2:1 AV block during exercise 3 months later. They suggested that transient complete AV block during RF ablation is a useful marker for the late development of AV block. In contrast, Jentzer et al reported that 9 of 52 patients (17%) had transient AV block during slow pathway ablation, and one of the 9 patients had late onset of complete AV block.[10] Chen et al also reported that 12 of 580 patients (2.1%) had transient AV block during slow pathway ablation, with only one patient developing complete AV block approximately 20 h after ablation.[11] More recently, Boulus et al reported that the incidence of complete AV block for a group of patients aged between 45 and 65 years was 2 of 102 patients (2.0%), 4 of 52 patients (8%) for those older than 65 years, and none of 117 patients for those younger than 45 years.[12] The patient described in the present report is young (aged 22 years) and had no AV block during RF ablation, which suggests that it is very difficult to predict the occurrence of a complete AV block after RF ablation.

The mechanisms for the development of late complete AV block after RF ablation are unclear; however, several possible explanations are postulated. First, effects of the ongoing healing process of the RF lesion, such as local inflammation and edema, may be associated with fibrosis formation that leads to extension of the lesion and impairment of AV conduction, which later results in an AV block.[5,13,14] In the present case, it is unlikely that fibrosis formation occurred because the complete AV block was transient. Second, the extension of microvascular endothe-
lial cell injury may be involved in the development of a late complete AV block after RF ablation. In this regard, Nath et al demonstrated that tissues next to the site of RF ablation show thermal injury, which might progress to have late effects on AV conduction. Another possible mechanism of AV block in the present case might be the result of the propafenone therapy; however, the patient took 150 mg of propafenone only once and her AV block persisted for 1 week. Considered together, we speculate that all these factors (pre-existing first-degree AV block, modulation of AV node by the ablation, and propafenone) may have contributed to the occurrence of a complete AV block. Further studies and case accumulations are required to elucidate the mechanisms of late and transient AV blocks after RF ablation.

Atrioventricular block as a complication of RF ablation for the treatment of AVNRT is a rare but serious complication of this procedure. For the patient described in the present report, it is possible that the fast pathway was damaged because of the pre-existence of a first-degree AV block. Because RF ablation was performed with caution around the position of the ablation catheter and the A–H interval carefully prolonged, and because there were no signs during RF ablation that suggested an AV block, we should consider the possibility of such a complication after RF ablation in patients with AVNRT, particularly the uncommon form, with continuous monitoring of these patients being essential.

References