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Brief Report

Ectopic atrial tachycardia due to aneurysm of the right atrial appendage

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Abstract We report an infant with ectopic atrial tachycardia, due to an aneurysm of the right atrial appendage, who developed congestive heart failure. Although catheter ablation was transiently successful, tachycardia recurred 2 days later. The aneurysm of the right atrial appendage was resected successfully by surgery, and thereafter she did well, reverting to normal sinus rhythm.

Keywords: ectopic atrial tachycardia, aneurysm of the right atrial appendage, catheter ablation

ECTOPIC ATRIAL TACHYCARDIA IS AN UNCOMMON arrhythmia that usually occurs in the young and may persist for months to years. This arrhythmia is difficult to treat medically, and may cause a dilated cardiomyopathy. Surgical treatment or catheter ablation is considered in patients who remain resistant to antiarrhythmic drug therapy. When atrial tissue is surgically removed for treatment of ectopic atrial tachycardia, it usually shows no pathologic abnormalities, either microscopically or macroscopically.[1] We present a patient with ectopic atrial tachycardia, due to an aneurysm of the right atrial appendage, who developed tachycardia-induced cardiomyopathy. After surgical resection of the lesion, she became asymptomatic and has maintained sinus rhythm.

Case report

An 11-day-old girl, born at 41 weeks gestation and weighing 3220 g, was transferred to our hospital because of tachyarrhythmia with a heart rate of 180 to 200/min. The liver was palpable 3 cm below the costal margin. A chest radiograph revealed an enlarged cardiac silhouette, with a cardiothoracic ratio of 78%. Cross-sectional echocardiographic examination revealed an atrial septal defect in the oval fossa with a diameter of 4 mm. The shortening fraction of the left ventricle was slightly reduced at 25%. The tachycardia persisted throughout the day, and could not be terminated by treatments including intravenous administration of adenosine triphosphate, disopyramide, procainamide or flecainide, or by transesophageal atrial pacing or direct current countershock. The 12-lead electrocardiogram on admission revealed distinct P waves. These P waves were positive in leads II, III, and aV_F, and deeply negative in lead V_1, indicating the ectopic atrial tachycardia originated from a focus near the right atrial appendage (Fig. 1A).[2] Combined oral administration of digoxin and propranolol controlled the heart rate at 150 beats per minute, and she was discharged at 2 months of age. The heart rate gradually increased after discharge, and congestive heart failure worsened. At the age of 7 months, she was readmitted for cardiac catheterization, electrophysiologic examination, and catheter ablation of the arrhythmia.

Cardiac catheterization showed that the ratio of pulmonary to systemic flow was 2.0, and there was no evidence of pulmonary hypertension. The left ventricular end-diastolic pressure was increased at 10 mm Hg. Rapid atrial pacing, at a rate of 250/min, allowed atrial capture, and upon termination of pacing, the tachycardia resumed after a few sinus beats. Mapping the sequence of atrial activation showed that the focus of the ectopic tachycardia was located in the right atrial appendage, and its local electrical activity preceded

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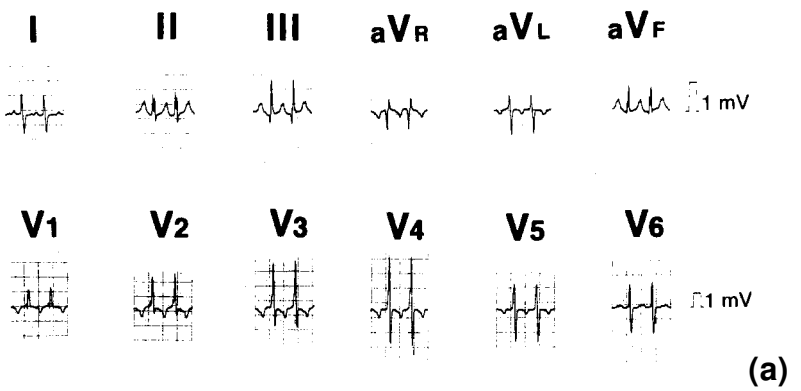
the surface P wave by 42 msec. After precision mapping with a 6-French quadripolar, 4-mm tip ablation catheter, ablation was attempted using radiofrequency current generated by an electrosurgical device (Model EPT 1000TC, EPT Technology Inc., San Jose, CA, USA). The temperature of the tip of ablation catheter was set for 60 (maximal output: 30W), and the duration time of each pulse was 30 sec. During the third ablation, the shape of P wave changed and was consistent with sinus rhythm, and the heart rate decreased to 110 beats per minute. Thereafter, angiography was carried out at the site of ablation, and an aneurysm of the right atrial appendage was recognized distal to the site of ablation (Fig. 2A). Because ectopic tachycardia could not be induced even after infusion of isoproterenol, the catheters were removed.

Two days after the ablation, tachycardia recurred. We decided to excise surgically the ectopic focus, and to close the atrial septal defect. This was undertaken at the age of 11 months. At operation, an aneurysm measuring 1 by 2 centimetres was recognized at the tip of the right atrial appendage (Fig. 2B). There were no other aneurysms on the remaining parts of either atrium. Epicardial mapping showed that the ectopic focus was in accordance with the location of the aneurysm (Fig. 1B, left). After clamping the lesion, the heart rate immediately decreased to 120 beats per minute, with the earliest site of atrial activation occurring in the sinus node (Fig. 1B, right). After resection of the aneurysm, sinus rhythm continued. Histologic examination of the wall of the aneurysm revealed that it was composed of fibrous tissue and attenuated myocardial fibers (Fig. 2C). The atrial septal defect was then directly closed under cardiopulmonary bypass. The postoperative course was uneventful, and the patient was discharged 10 days after the operation, being free of symptoms and in sinus rhythm requiring no antiarrhythmic medication.

Discussion

In the majority of patients with ectopic atrial tachycardia, the focus of the tachycardia cannot be macroscopically discriminated. There are six reported cases in which the focus of the ectopic tachycardia has been found to be structurally abnormal: five with aneurysms or diverticulums of



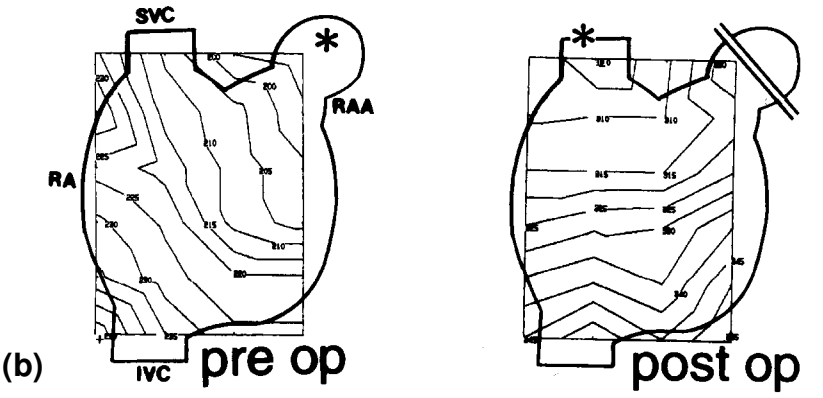


Figure 1.
A. Twelve-lead electrocardiogram on admission. The P waves are positive in leads II,III, and aV_F, and deeply negative in lead V_1.
B. Epicardial mapping during cardiac surgery. The left panel shows that the earliest activation site of the atrium (asterisk) is located in the right atrial appendage (RAA). The right panel shows that the earliest site of atrial activation shifted to the sinus node near the superior caval vein (SVC) after resection of the right atrial appendage aneurysm.

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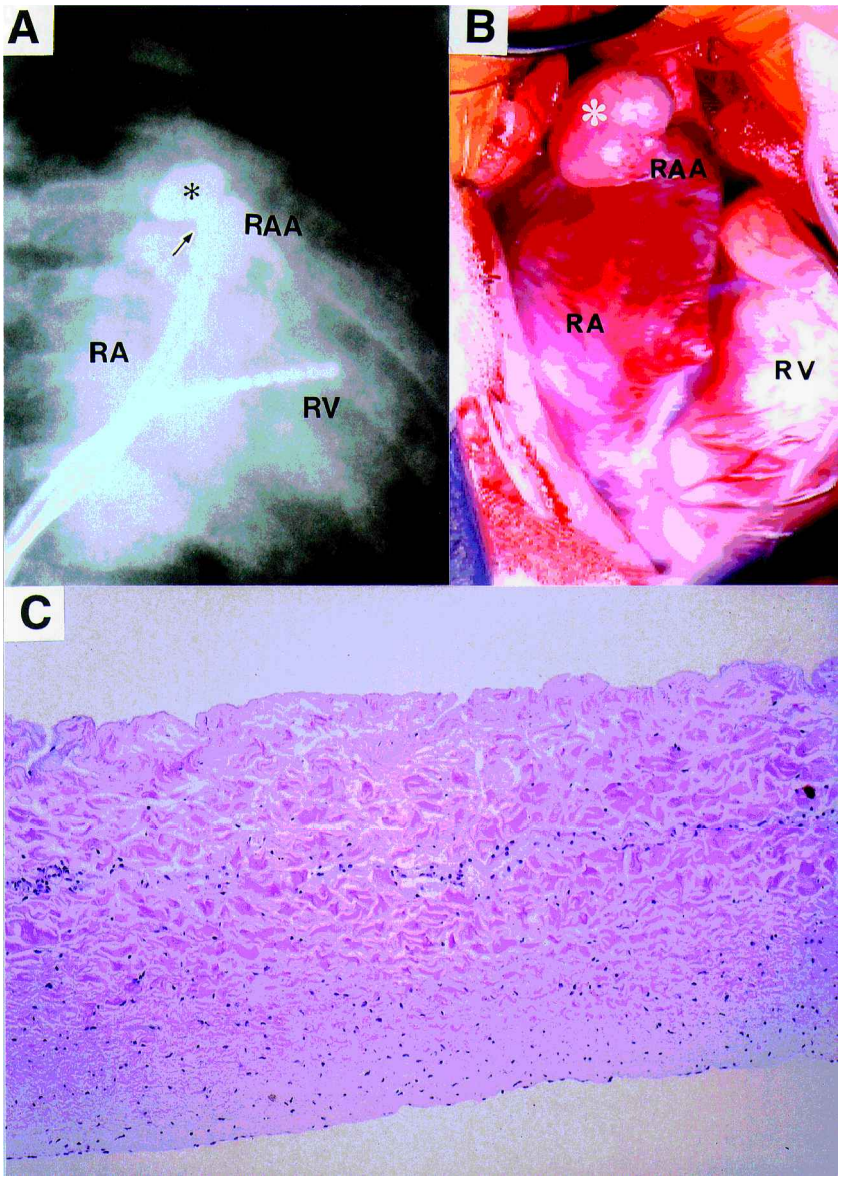

Figure 2.
A. Cineangiogram (right anterior oblique 30°) using right atrial injection. An aneurysm (asterisk) is recognized at the tip of the right atrial appendage (RAA). The ablation site is denoted by the arrow.
B. Operative view of the aneurysm of the right appendage (asterisk). The size of the aneurysm was 10 × 20 mm.
C. Histologic section of the wall of the aneurysm of the right atrial appendage. The atrial wall is composed of fibrous tissue and severely attenuated myocardial fibers. (Hematoxylin and eosin stain, X25)

the atriums,[3–7] and one with rhabdomyoma.[8] Atrial aneurysms are located mainly on or near the atrial appendage, and in three of five cases, both right and left atrial appendages were involved. Although the mechanism of tachycardia in our patient is not completely understood, there are at least two possibilities. One is that there was an ectopic focus in the aneurysm of the right atrial appendage with enhanced automaticity. The other is that the mixed arrangement of atrial muscle fibers and fibrous tissues, demonstrated by histopathologic examination, created a reentrant circuit.

Walsh et al.[4] postulated that patients with ectopic atrial tachycardia and ventricular dysfunction are poor surgical candidates, and are also less than ideal candidates for antiarrythmic therapy. In such situations, transcatheter ablation is now considered the first-line therapy, although the experience with this technique is limited. Acute rates of success are reported to be 80 to 90% for ectopic atrial tachycardia, although recurrences are frequent, with long-term success rates between 50 to 60%.[1] There is one report of transcatheter ablation for ectopic atrial tachycardia in a patient with a large right atrial aneurysm.[4] In this case, cardiac ablation resulted in acceleration of the tachycardia, and resection of the abnormal atrial tissue was subsequently performed. Our ablation was also unsuccessful, probably because the substrate for the ectopic atrial tachycardia was too large to allow complete obliteration of the ectopic focus or reentrant circuit. To achieve successful catheter ablation in patients with ectopic atrial tachycardia due to structural lesions, a wider area of

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ablation must be carried out. When the arrhythmia is resistant to medical treatment or catheter ablation, surgical ablation of the focus may be required.

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