

Incessant Long R-P Tachycardia



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KEYWORDS

• Catheter ablation • Atrial tachycardia • Left atrial appendage

KEY POINTS

- A 13-year-old boy had a positive P wave in V1 with a negative P wave in lead I, aVL, and aVR, as well as a positive P wave in the inferior leads, which correlated with a left atrial appendage (LAA) atrial tachycardia (AT) focus.
- Many features of this case are helpful to the diagnosis and treatment of LAA AT.
- P-wave morphologies can provide clues regarding an AT's origin, and our case with a P-wave negative in lead I favored LAA AT.
- The atrial activation sequence was earliest in the LAA.
- Careful mapping along the atria and coronary sinus to determine the earliest site of activation for the surface P-wave is a reliable method for precisely localizing the AT origin as a target for catheter ablation.

CLINICAL PRESENTATION

A 13-year-old boy presented to the hospital for acute appendicitis and was noted to be in tachycardia with a heart rate of 220 beats per minute (bpm). An electrocardiogram was performed and it showed a narrow complex tachycardia at 220 bpm. The patient reported occasional palpitations, especially on heavy exercise, but denies any dizziness or syncope. His transthoracic echocardiogram showed a severely depressed left ventricular systolic function with ejection fraction (EF) at 20% to 24%.

He was started on propranolol 40 mg 3 times a day then loaded with amiodarone and followed

by a maintenance dose of 200 mg a day. Six months later, the amiodarone was switched to flecainide 100 mg twice a day. The patient continued to have intermittent palpitations. His follow-up electrocardiogram revealed the same narrow complex tachycardia but slower, at 110 to 130 bpm, with only occasional sinus beats. He was referred for an electrophysiology (EP) study and ablation.

ELECTROPHYSIOLOGY STUDY

In the EP laboratory, an octapolar coronary sinus was introduced percutaneously from the right femoral vein and positioned into the coronary

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sinus. A detailed mapping of the tachycardia was performed using the 8-Fr Thermocool open irrigated mapping/ablation catheter with a 3.5-mm tip. Bipolar electrograms (30–500 Hz) were displayed and stored using a digital recording system (EP MedSystems, West Berlin, NJ). Three-dimensional electroanatomic mapping was performed with Ensite NavX (St Jude Medical, St Paul, MN) as well as the triggered sweep for detailed determination of the site of origin of the tachycardia. There was evidence of wobbling of the tachycardia cycle length with a change in atrial rate driving the change in the ventricular rate that favored a diagnosis of atrial tachycardia (AT).

QUESTION: WHERE IS THE SITE OF ORIGIN OF THE FOCAL ATRIAL TACHYCARDIA?

Analysis of P-wave morphology during tachycardia revealed a positive P wave in lead V1, positive in inferior leads, negative in lead I, and flat in V5 and V6 (Fig. 1), indicating that the tachycardia is originating from the left atrium.

Mapping of the left atrial (LA) cavity, the pulmonary veins, the mitral annulus, and the LA appendage (LAA) showed that the earliest atrial activation was located in the apex of the LAA (Fig. 2). A lesion was delivered with an irrigated ablation catheter with 30 W for 60 seconds, causing

intermittent interruption of the tachycardia (Fig. 3). Five additional lesions received 35 W for 60 seconds each at and around the site of earliest activation in the LAA (Fig. 4). The tachycardia never recurred, even after a waiting period of 90 minutes on and off isoproterenol as well as after 24 hours of telemetry monitoring. His EF normalized to 60% and he has remained symptom free over the last 2 years.

DISCUSSION

Focal ATs are uncommon causes of supraventricular tachycardia (SVT) in adults, accounting for 5% to 10% of cases. They usually occur along the crista terminalis in the right atrium and near the pulmonary veins in the left atrium. Less frequently, they can arise from the aortic cusps, coronary sinus ostium and musculature, the para-Hisian region, the right atrial appendage and LAA, or along the tricuspid or mitral annulus.^{1,2} This case involves an AT originating from the LAA, which is a rare focus and accounts to 0.6% of focal AT.¹

Analysis of P-wave morphology during SVT and/or ectopic atrial impulses is useful in localizing the site of focal ATs. Several P-wave algorithms have been developed to help determine the AT site of origin.^{1,3,4} In a recent algorithm, Kistler and colleagues¹ reported that a positive P wave in leads V1 to V3 with isoelectric P wave in lead V6, a

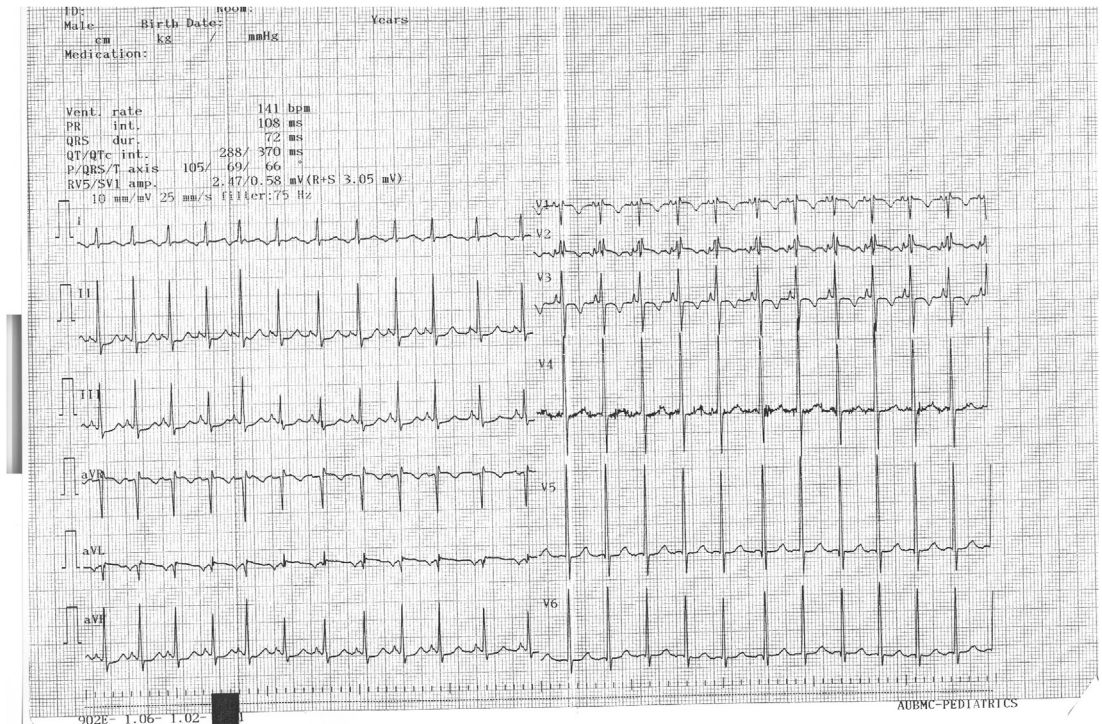


Fig. 1. Long R-P tachycardia with P-wave morphology in supraventricular tachycardia.

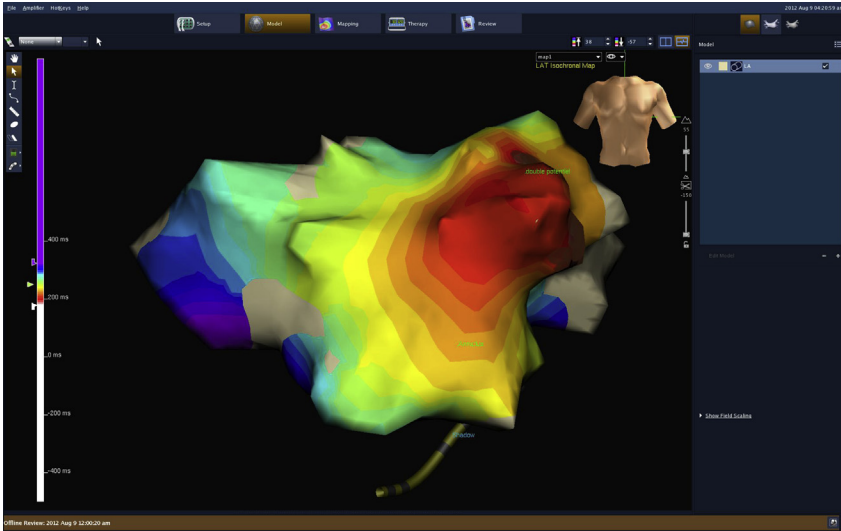


Fig. 2. Electroanatomic map in the right anterior oblique view showing the site of earliest atrial activation in the LAA.



Fig. 3. Termination of the AT and change in atrial activation sequence with successful ablation of the LAA AT.

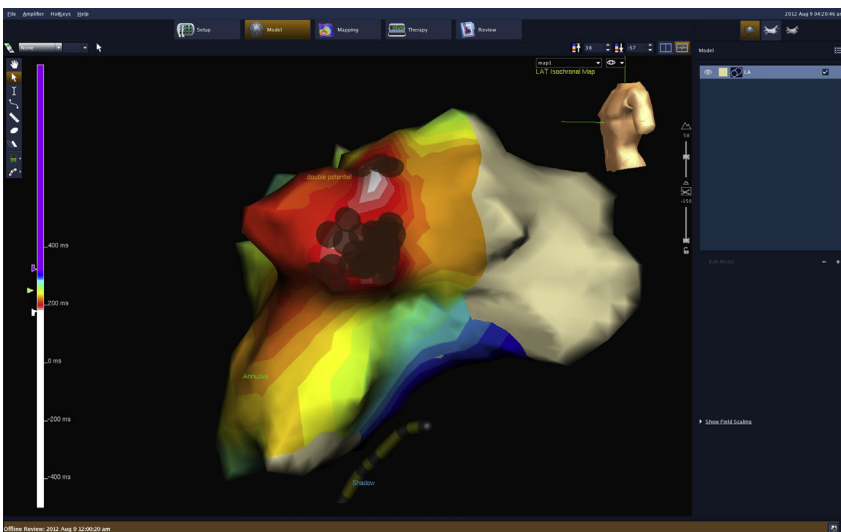


Fig. 4. Electroanatomic map in left anterior oblique view showing the ablation lesions delivered at the site with earliest atrial activation in the LAA.

negative P wave in aVL, a negative P wave in lead I, with positive P wave in the inferior leads favored an LAA focus. In the 2 cases of LAA AT out of the 196 focal AT, 1 patient had an isoelectric P wave in aVR and 1 patient had a negative P wave in aVR.¹ Our case had a positive P wave in V1 with a negative P wave in lead I, aVL, and aVR, as well as a positive P wave in the inferior leads, which correlated with an LAA AT focus.

Many features of this case are helpful to the diagnosis and treatment of LAA AT. P-wave morphologies can provide clues regarding an AT's origin and this case with a P-wave negative in lead I favored LAA AT. The atrial activation sequence was earliest in the LAA. Careful mapping along the atria and coronary sinus to determine the earliest site of activation for the surface P wave is a reliable method for precisely localizing the AT origin as a target for catheter ablation.

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