



Case Report

Reentrant circuit of adenosine-sensitive atrial tachycardia originating near the his bundle region revealed by entrainment pacing and catheter ablation of the ‘entrance’



Atsuhiko Yagishita (MD)*, Kikou Akiyoshi (MD), Masahiko Goya (MD), Kenzo Hirao (MD)

Department of Cardiovascular Medicine / Heart Rhythm Center, Tokyo Medical and Dental University, Tokyo, Japan

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ABSTRACT

The mechanism of adenosine-sensitive atrial tachycardia (AT) originating near the His bundle region has been reported to be due to reentry, as indicated by entrainment pacing at a site remote from the ‘entrance’ to the slow conduction zone of the postulated reentrant circuit. We report a case of AT, in which the change in response to the entrainment pacing following radiofrequency applications at the ‘entrance’ to the slow conduction zone not only suggested that the mechanism of the AT was reentry, but also the size of the reentrant circuit.

<Learning objective: The mechanism of adenosine-sensitive atrial tachycardia (AT) with an earliest atrial activation site near the His bundle has been reported to be due to reentry, but the size of the postulated reentrant circuit remains uncertain. This case suggested not only the mechanism of the AT was reentry, but also the size of the reentrant circuit localized near the His bundle based on the response to entrainment pacing after the radiofrequency applications at the ‘entrance’ to the slow conduction zone of the reentrant circuit.>

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Introduction

Adenosine-sensitive atrial tachycardia (AT) originating near the His bundle region has been reported to be due to reentry [1], as indicated by entrainment pacing at a site remote from the ‘entrance’ to the slow conduction zone, which can be an alternative target to the ‘exit’ exhibiting the earliest atrial activation for catheter ablation [2–4]. We report a case of an adenosine-sensitive AT, in which the size of the reentrant circuit was implicated by the response to entrainment pacing before and after catheter ablation of the ‘entrance’.

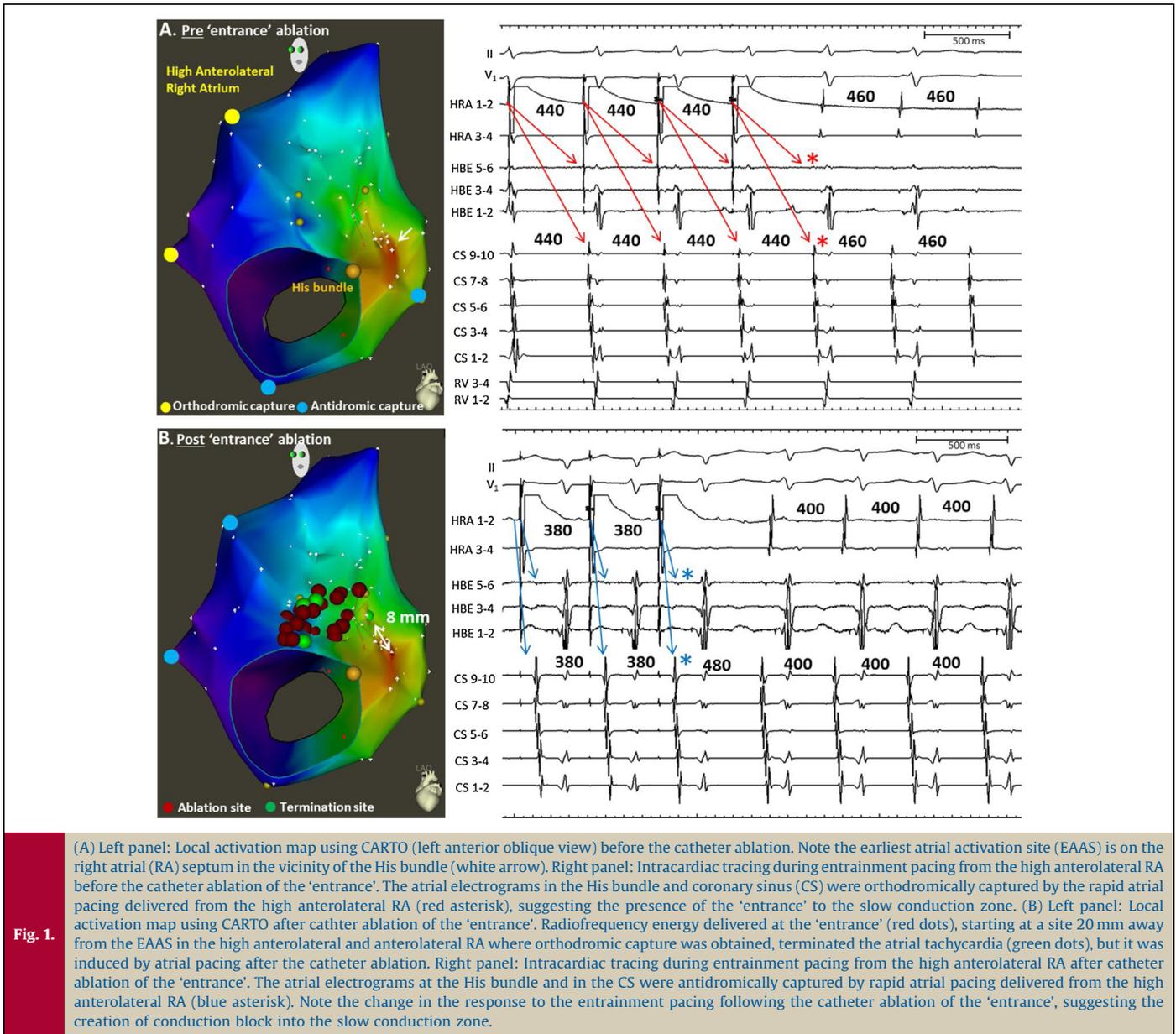
Case report

A 69-year-old female who was referred to our institute for a recurrent focal AT after an index procedure underwent catheter ablation. The AT with a cycle length of 460 ms was terminated after

the administration of 4 mg of adenosine triphosphate following a gradual prolongation of the cycle length, and a centrifugal activation from the vicinity of the His bundle region was displayed on the local activation map using CARTO (Biosense Webster, Diamond Bar, CA, USA). Entrainment pacing from the high anterolateral right atrium (RA) and anterolateral RA revealed orthodromic capture with a long conduction time recorded by the distal bipole of the His bundle catheter (Fig. 1A), whereas entrainment pacing from the cavo-tricuspid isthmus and lower RA septum exhibited antidromic capture, indicating that the AT was an adenosine-sensitive AT originating near the His bundle with an ‘entrance’ to the slow conduction zone in the anterior-septal RA. Radiofrequency (RF) energy delivered at the ‘entrance’, a site 20 mm away from the earliest atrial activation site (EAAS) in the direction of each entrainment pacing site, terminated the AT, but it could be induced by atrial pacing. Despite additional RF energy applications applied 8 mm closer to the EAAS, it could still be induced during an infusion of isoproterenol. Of note, the entrainment pacing from the high anterolateral RA and anterolateral RA became antidromic after additional RF applications, suggesting the catheter ablation resulted in conduction block to the ‘entrance’ (Fig. 1B). To avoid the risk of atrioventricular (AV) block by the additional RF energy applications at the ‘entrance’,

* Corresponding author at: Department of Cardiovascular Medicine, Heart Rhythm Center, Tokyo Medical and Dental University, Yushima 1-5-45, Bunkyo-ku, Tokyo, #113-8510, Japan.

E-mail address: atsuhikoyagishita.cvm@tmd.ac.jp (A. Yagishita).



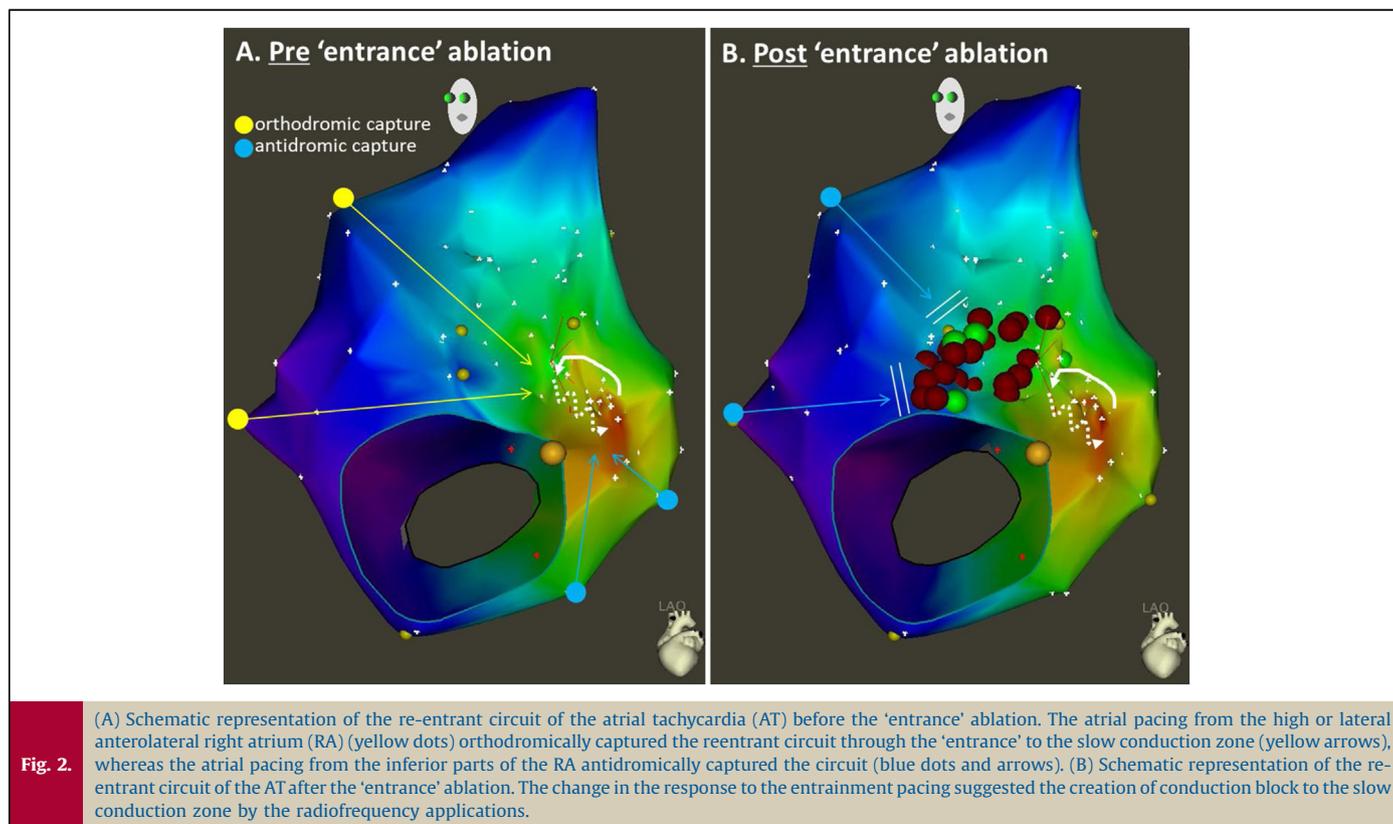
within close proximity to the EAAS in the RA, catheter ablation targeting the 'exit' was attempted. The earliest activation recorded by the distal bipole of the ablation catheter located at the noncoronary cusp was 10 ms earlier than the His bundle catheter. An RF energy delivery of 20 W terminated the AT within 1 second, and was increased to a maximum power of 30 W for 60 seconds without any prolongation of the AH interval (Fig. 2). After the single RF application, no further AT was initiated or induced, and the patient has been free from any AT following the procedure.

Discussion

The mechanism of adenosine-sensitive AT with an EAAS near the His bundle has been reported to be due to reentry. Considering the sensitivity to adenosine of the AT, a calcium channel-dependent tissue, such as an AV node-like structure, is suggested to be involved in the reentry circuit [1]. As an analogous mechanism to AV nodal reentrant tachycardia, there have been

no reports demonstrating any direct evidence of the slow conduction of this AT displaying a centrifugal activation on the 3D electroanatomical map [4], and the size of the reentrant circuit of the AT remains uncertain.

Catheter ablation targeting the 'entrance' to the slow conduction zone indicated by manifest entrainment, defined as orthodromic capture of the EAAS with a long conduction time, can eliminate the AT [2,3], which may be an alternative to the established ablation strategy targeting the EAAS representing the 'exit' [4]. This case is unique in that the change in the response to entrainment pacing following RF applications at the 'entrance' not only confirmed that the mechanism of the AT was reentry, but also implicated the size of the reentrant circuit within the confined area near the His bundle. Interestingly, the AT was induced after terminating the AT by an RF application at a more distant lesion site from the EAAS, possibly due to an insufficient RF energy delivery to completely eliminate the slow conduction, a broader width of the slow conduction zone, or a possible shift of the reentrant circuit to the left atrium.



Conflicts of interest

The authors declare no conflict of interests for this article.

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