ISSN NO: 1073 - 7774
Volume 06 Issue 02 Aug 2016

Paroxysmal supraventricular tachycardia treatment with atrioventricular node modification

Lei Li1
Department of Cardiology, Fudan University Jinshan Hospital, Shanghai

ABSTRACT

In order to treat atrioventricular nodal reentrant tachycardia (AVNRT), it is common practice to modify the atrioventricular node. We are really concerned about preventing atrioventricular block, the most serious consequence of this procedure. There are certain, potentially dangerous situations in which this problem always arises. Therefore, understanding such circumstances, as discussed in this work, is crucial. A cardiac electrophysiological study revealed sluggish conduction in both the antegrade and retrograde channels of the reentrant loop, allowing for the induction of classic AVNRT, in a patient who had been experiencing paroxysmal palpitations for 10 years, which had progressed to shortness of breath and chest discomfort for 1 year. No junctional beat was detected throughout the successful ablation procedure. For certain unique situations, it is important to consider both the junctional rhythm and the timing of the cardiac electrophysiological examination when modifying the atrioventricular node. This will help prevent the serious problem of atrioventricular block, which can be caused by excessive ablation.
Key words: Paroxysmal supraventricular tachycardia, atrioventricular nodal reentrant tachycardia, and radiofrequency catheter ablation.

INTRODUCTION

Inflammation usually conducts slowly in the antegrade route and rapidly in the retrograde way; many cases of paroxysmal supraventricular tachycardia are caused by atrioventricular nodal reentry. Patients experiencing this kind of tachycardia often report abrupt onset or cessation of symptoms as well as recurrent episodes of paroxysmal palpitation. The gold standard for treating this condition is radiofrequency catheter ablation, which modifies the atrioventricular node. To prevent damaging the atrioventricular node by excessive ablation, operators often evaluate the ablation impact throughout this course by looking for junctional rhythm and then determining the ablation time. However, operators will face extra challenges and danger while ablating in some specific cases with unusual electrophysiological abnormalities, like the one described below.

CASE REPORT

A male patient, aged 22, who had been experiencing intermittent palpitations for a decade and worsening chest pain and difficulty breathing for a year, appeared with tachycardia that might start or stop suddenly. Other medical conditions were not mentioned. Chest pain and difficulty breathing were his symptoms, which used to happen once yearly but have been happening more often over the last year. He did not exhibit any unusual symptoms upon admission. According to the ultrasound, the heart's shape and blood flow are normal. No abnormalities were seen in the sinus rhythm of the electrocardiogram (ECG), although there was narrow QRS wave tachycardia at 167 beats per minute (bpm) and RP = 80 ms, with RP < PR [Figure 1]. Atrioventricular nodal reentrant tachycardia was considered probable based on these symptoms and the patient's medical history. Mechanical irritation by catheter during the operation could induce paroxysmal supraventricular tachycardia (PSVT), which could be terminated by ventricular stimulation and exhibited the characteristics of atrioventricular nodal reentrant tachycardia (AVNRT), according to the intracardiac electrophysiological examination and ablation (Figure 2). Atrium-ventricular bypass was ruled out as ventricular-atrial dissociation became apparent at a rate of 110 bpm for ventricular grading frequency increment stimulation (S1S1). No tachycardia was induced by right atrial S1S1. Figure 3 shows that a trio of atrioventricular reentrant waves were produced by a right atrial programmed basic stimulus in conjunction with a cyclelength decreasing extrastimulus (S1S2), resulting in numerous AV conduction jumps. Each of these jumps had an AV interval longer than 70 ms. Typical AVNRT, with slow antegrade and quick retrograde conduction, and the same rate and morphology as spontaneous PSVT, may be induced by further S1S2 scanning. Based on the findings, it seems that the atrioventricular node has many reentrant pathways. Afterwards, using fluoroscopy and an internal electrocardiogram as guides, we ablated the atrioventricular node's sluggish conduction region at many excellent target locations below and above the ostium of CS. The junctional rhythm, which has long been recognized as the gold standard for evaluating atrioventricular node modifications, was absent throughout this process [Figure 4].

ISSN NO: 1073 - 7774
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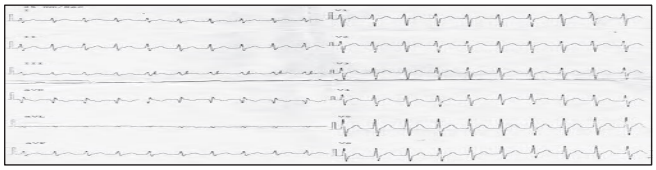

Figure 2: Inner ECG during tachycardia. Ventricular wave (V) and atrial wave (A) interfused at CS leads from proximal to distal. PSVT=paroxysmal supraventricular tachycardia, ECG=electrocardiogram, CS1-10=coronary sinus electrograms from distal to proximal, RV=electrogram recorded by right ventricle catheter.

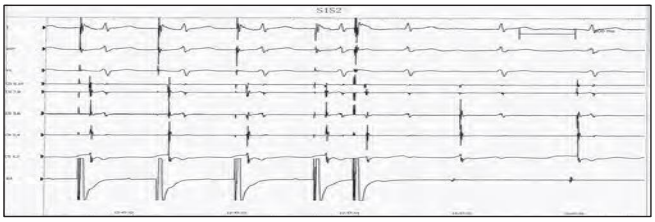

Figure 1: ECG during onset of paroxysmal tachycardia. Narrow QRS wave tachycardia, 167 bpm, RP = 80ms, RP < PR. Arrows direct to P wave.**Figure 3:** S_1S_2-induced atrioventricular reentrant waves, which showed the phenomenon of slow conduction in both antegrade and retrograde paths. S_1S_2=programmed basic stimulus coupled with cycle length decreasing extrastimulus, RA=electrogram recorded by right atrial catheter, other abbreviations as in Figure 2.

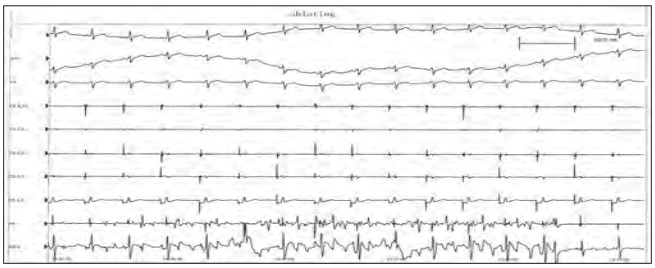

Figure 3 During the course of mmodification of atrioventricular node, there was no junctional rhythm. ABLd=electrogram recorded by distal leads of ablating catheter, other abbreviations as in Figure 2.

of the ablating effect. Normal sinus rhythm and normal atrioventricular conduction remained after modification. Repeated intracardiac electrophysiological examination: Right atrial programmed S_1S_2 induced no AV conduction jump phenomenon, no reentrant wave or any tachycardia; and S_1S_1 at right atrial and right ventricular induced no tachycardia; Wenckebach point of atrioventricular nodal conduction induced by atrial S_1S_1 greater than 170 bpm. Examination demonstrated the successes of the operation.

Three-month follow-up met no recurrence of tachycardia and no complication.

DISCUSSION

PSVT due to AVNRT sometimes has unconventional manifestation.[1] Electrophysiological physicians are constantly engaged in probing its mechanism and searching for the more safe methods to perform ablation.[2-4]

From the intraoperative intracardiac electrophysiological findings and ablation results, the mechanism for the tachycardia is atrioventricular nodal reentry, slow in antegrade and fast in retrograde conduction. But the repeatable atrioventricular nodal reentries also induced by S_1S_2 in the examination were featured by its slow conduction in both antegrade and retrograde pathsMoreover, during effective ablating there was no junctional rhythm, which always appears and been considered as the standard evaluation of the ablating effect. This special condition displayed by these two rare electrophysiological phenomena deserves our caution.

Implications of the case: Much more judgment difficulties add to the radiofrequency ablation of AVNRT, if there is no characteristic junctional rhythm in some special complex condition which are not common, and the potential risk of severe complication also add to these cases. After a certain time of ablation by experience at chosen ideal target point

guided by inner cardiac electrograms and fluoroscopic images, cardiac electrophysiological test should be performed in time to judge whether the ablation is accomplished or not, but can not only rely on the appearance of junctional rhythm to judge the effect of modification of atrioventricular node, in order to avoid the severe complication of atrioventricular block caused by excessive ablation.

In addition, if there is any correlation is unknown between the absence of junctional rhythm during ablating and the peculiarity of slow conduction in both antegrade and retrograde path of its reentrant loop before ablation.

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