

# Is routine echocardiography necessary after catheter ablation of atrioventricular nodal re-entrant tachycardia?

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## Abstract

**Background:** *The aim of this study was to investigate whether pericardial effusion (PE) detected by transthoracic echocardiography (TTE) was clinically significant and whether routine echocardiography was necessary after catheter ablation of atrioventricular nodal re-entrant tachycardia (AVNRT).*

**Methods:** *A total of 202 patients with AVNRT were included in the study from three centers. The patients received basic electrophysiology-guided therapy, followed by radiofrequency ablation (RFA). All patients underwent TTE before and after RFA therapy.*

**Results:** *The mean age of the study population was  $46.2 \pm 17.9$  and 30.7% of the patients were male. Of these patients, six (3%) had postoperative PE, as detected by TTE. However, none of them had cardiac tamponade (CT). Four patients had minimal PE, while two had mild PE. Repeated TTE at one to three months showed resolved PE. No significant difference was seen among the patients with and/or without PE in terms of age, gender, the number of RFA applications, or RFA duration; however, significantly prolonged duration of fluoroscopy exposure was observed in the patients with PE.*

**Conclusions:** *PE was detected in 3% of the patients by TTE and associated with prolonged duration of fluoroscopy exposure. However, no patients with moderate or large PE or cardiac tamponade were found in the study. In conclusion, we suggest that TTE should only be performed in the presence of clinical indications following ablation of AVNRT. (Cardiol J 2012; 19, 3: 274–277)*

**Key words:** atrioventricular nodal re-entrant tachycardia, echocardiography, pericardial effusion, radiofrequency ablation

## Introduction

Radiofrequency catheter ablation (RFA) has become the first-line therapy for atrioventricular nodal re-entrant tachycardia (AVNRT) [1–3].

The incidence of pericardial effusion (PE) and cardiac tamponade (CT) following radiofrequency ablation (RFA) of AVNRT have been found to be quite low [4–9], and the American College of Cardiology (ACC)/American Heart Association (AHA)

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guidelines do not state that it is necessary to perform echocardiography to detect these complications [10]. The incidence of PE has been underestimated in many studies, since transthoracic echocardiography (TTE) has been performed in cases of the presence of clinical indications. There is very limited evidence on the incidence and clinical significance of PE following RFA therapy.

In this study, we investigated whether the incidence of PE or CT detected by TTE is clinically significant and whether routine echocardiography is necessary after catheter ablation of AVNRT.

## Methods

### Patient population

Between January 2007 and May 2011, a total of 202 patients who were scheduled to undergo RFA of AVNRT were included in this prospective study conducted in three centers (Hospital A, Hospital B, and Hospital C). Electrophysiology study (EPS) and RFA were performed using three operators.

All patients who underwent RFA had TTE performed before the procedure and again in the first 24 h after the procedure. PE was graded on the basis of the effusion thickness measured during diastole in the parasternal short-axis images. Accordingly, < 1 mm was considered as minimal, 1–10 mm was mild, 10–20 mm was moderate, and > 20 mm was large. CT was defined as moderate or large when concomitant hemodynamic compromise was found with PE. The study was reviewed and approved by the local Ethics Committee.

### Electrophysiology study and RFA therapy

EPS was performed by placing a quadripolar catheter at the right ventricular apex and His bundle and a decapolar catheter at the coronary sinus via femoral veins. Drugs preceding EPS were discontinued before at least five half-lives. The basic electrophysiological measurements were performed and AVNRT was induced in accordance with the predefined protocols.

Ablation procedure was performed using a 4-mm tip ablation catheter and giving RF energy at a low voltage. RFA was performed using the predefined mapping and ablation techniques. The RF energy was delivered with a power typically to achieve a temperature of 50–65°C. Considering intracardiac electrographic and fluoroscopic findings, the RF energy was applied to appropriate sites for between 30 s and 2 min. The procedure was terminated in cases of the absence of junctional rhythm within the first 10 s, occurrence of fast junctional

tachycardia with cycle lengths below 350 ms, occurrence of ventriculoatrial or atrioventricular block, or excessive increase of impedance. RFA procedure was performed by an antegrade approach from the femoral vein through the posteroseptal area of the tricuspid annulus.

### Statistical analysis

Normally distributed numeric variables were expressed in mean  $\pm$  standard deviation, whereas non-normally distributed numeric variables were expressed in median, and categorical variables were expressed in percentage. A p value of < 0.05 was considered statistically significant. Student's *t*-test was used for normally distributed numeric variables in the intergroup analysis, Mann-Whitney U test was used for non-normally distributed numeric variables, and  $\chi^2$  test was used for categorical variables in the intergroup analysis. Statistical analysis was performed using SPSS v.15.0 (Statistical Package for Social Science; SPSS Inc., Chicago, IL, USA).

## Results

A total of 202 patients with AVNRT were included. The mean age was  $46.2 \pm 17.9$  years and 30.7% of the patients were male. Of these patients, TTE showed minimal PE only in one patient before catheter ablation. Six (3%) had PE as detected by TTE, but none of them had CT after catheter ablation. Four patients had minimal PE, while two had mild PE. No moderate or severe PE was detected. These patients were asymptomatic and were scheduled for follow up. Control TTE at 1–3 months showed resolved PE. No difference was seen among patients with and without PE in terms of age, gender, the number of RFA applications, or RFA duration; however, significantly prolonged duration of fluoroscopy exposure was observed in patients with PE (Table 1).

## Discussion

Our study revealed that the incidence of PE was very low (3%) following RFA of AVNRT and also that there was no hemodynamically relevant PE or CT. We also demonstrated that fluoroscopy duration is an important factor for the development of PE after RFA therapy, although the number of RFA applications and RFA duration were not. Based on these results, we suggest that routine echocardiography is not necessary after RFA of AVNRT patients, but in the presence of clinical or hemodynamic doubt, or prolonged fluoroscopy exposure for various reasons, it would be appropriate.

**Table 1.** Comparison of clinical and procedural characteristics according to the presence and absence of pericardial effusion.

Variables	Effusion present (n = 6)	Effusion absent (n = 196)	P
Age [years]	45 ± 20	46 ± 17	0.95
Sex (male/female)	1/5	61/135	0.45
Radiofrequency duration [s]	129 ± 42	117 ± 51	0.54
Radiofrequency application no. (median)	3.5	3.5	0.35
Fluoroscopy duration [min]	78 ± 24	53 ± 17	0.01

**Table 2.** Frequency of pericardial effusion and cardiac tamponade in patients undergoing slow pathway ablation\*.

Study	Age	No. of patients	Study	PE [%] and no.	Type of PE	Tamponade [%]
Schaer et al. [8]	55 ± 16	184	R	2.1%: 4 pts	4 small	0
Kihel et al. [4]	56 ± 17	276	P	0.4%: 1 pt	Not specified	1
Hoffman et al. [6]	?	3234	P	0.2%: 7 pts	Not specified	1
Haghjoo et al. [7]	49 ± 14	268	R	0.7%: 2 pts	Not specified	0
Kammeraad et al. [5]	1–19 years	65	R	1.5%: 1 pt	Not specified	0
Pires et al. [9]	?	120	P	4.1%: 5 pts	5 small	0
Present study	46 ± 17	202	P	3.0%: 6 pts	4 minimal, 2 small	0

\*Studies performed by routine echocardiography before and after catheter ablation were included; PE — pericardial effusion; P/R — prospective/retrospective studies

RFA for patients with AVNRT is a highly effective treatment option (> 98%) and has started to become the first-line therapy. It is a safe method for acute periods while having a very low complication rate [11–13], PE, which is one of the minor complications, may develop after RFA of AVNRT as well as RFA of accessory pathway, atrial flutter and atrial fibrillation [8]. However, there is limited evidence on the incidence and clinical significance of PE following RFA therapy. In our study, we found the incidence of PE to be 3%. Many studies have reported the incidence of PE to be between 0.2% and 4% (Table 2). However, this is not the actual rate. There are several reasons why the actual incidence rate is underestimated. The most important reason is that TTE was not performed routinely, or only performed after RFA for clinically indicated situations, in most of the large, prospective studies related to AVNRT. The second reason is that the actual incidence rate might have been underestimated in retrospective studies due to missing data or selection bias. The third reason is that there is no consensus on the definition of PE detected by TTE.

In this study, we graded PE as minimal, small, moderate or large. Similarly, Schaer et al. graded PE as small, moderate or large [8]. Pires et al. [9]

reported small PE in their study; however types of PE were not reported in other studies. In our study, the incidence of PE was 3%. However, if minimal PEs were excluded, the incidence would be 1%.

There are some reports on PE following RFA of supraventricular arrhythmias. In a prospective study in which 966 patients underwent TTE following RFA of AVNRT, AVRT or AV junction, Calkins et al. [14] found the incidence of CT, PE, and pericarditis to be 0.6%, 1.9% and 0.38%, respectively. This prospective study did not provide any separate analysis for arrhythmia types. The higher incidence of PE and CT was mostly reported in patients with supraventricular arrhythmia who underwent RFA of atrial fibrillation [15]. The incidence of PE was 1–13%, while the incidence of CT was < 1%, following RFA of atrial fibrillation [8, 16, 17]. Transseptal puncture can also result in development of a transmural lesion, and excessive manipulation of the catheter positioned in the left atrium may increase the incidence of PE.

The reason of non-hemodynamically significant PE following RFA of AVNRT may be explained by several mechanisms. We believe the primary mechanism is the excessive intracardiac catheter manipulation and duration of the procedure or fluoroscopy. Prolonged catheter manipulation leading

to mechanical tissue trauma and effusion is a cause of prolonged fluoroscopy.

In our study, the number of RFA applications and total RFA duration were not associated with PE, suggesting that lesion formation following RFA procedure might not be associated with the development of effusion. Pires et al. [9] found that the number of RFA procedures was not associated with the development of PE.

## Conclusions

The incidence of pericardial effusion after RFA of AVNRT was very low and there was no hemodynamically relevant effusion or tamponade. Accordingly, instead of performing routine echocardiography, it should be considered only in clinically indicated conditions following RFA treatment.

**Conflict of interest:** none declared

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