

ECHOCARDIOGRAPHIC EVALUATION OF REGIONAL LEFT ATRIAL FUNCTION AFTER RAPID ATRIAL PACING

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Abstract: Rapid regular atrial pacing (RAP) produces changes in atrial function similar to those caused by atrial fibrillation in animal models. Left atrial appendage (LAA) function represents regional atrial function. The aim of our study was to investigate the influence of RAP on left atrial regional function and to evaluate the reversibility of changes after termination of pacing in a canine model. Eight dogs were subjected to RAP (400 bpm) for 16 days. Transesophageal echocardiography was performed at baseline, immediately after RAP and 4 weeks after the termination of RAP. The LAA peak late emptying velocity (LAA-E) and filling wave (LAA-f) were measured. LAA-E velocities were significantly reduced and filling wave velocities (LAA-f) were significantly less negative after RAP compared with the baseline values. Four weeks after termination of pacing, the LAA-E and LAA-f velocities were normal. RAP results in impaired regional atrial systolic and diastolic function. The changes were completely reversible 4 weeks after termination of pacing. These results suggest that the LAA is mechanically stunned after RAP.

Key Words: Left Atrial Appendage, Atrial Function, Atrial Fibrillation.

INTRODUCTION

The left atrial appendage (LAA) is a highly contractile pump with a pattern of contraction quite distinct from that of the main body of the left atrium [1, 2]. LAA function represents regional atrial function. A dilated and hypokinetic LAA is frequently the site of intracavitary thrombi formation [3]. Rapid regular atrial pacing (RAP) produces changes in atrial function similar to those caused by atrial fibrillation (AF) in animal models. The aim of our study was to investigate the influence of RAP on left atrial regional function and to evaluate the reversibility of changes after the termination of pacing in a canine model.

METHODS

Eight dogs (beagles) were subjected to 16 days of RAP (400 bpm). The left ventricular ejection fraction was preserved after RAP. Transesophageal echocardiography was performed with a 5.0 MHz monoplane probe at baseline, immediately after RAP and 4 weeks after the termination of RAP. The LAA peak late emptying velocity (LAA-E) and filling wave (LAA-f) were measured in the modified middle transverse plane. LAA-E represents LAA contraction and LAA-f corresponds to LAA relaxation.

RESULTS AND DISCUSSION

The late diastolic LAA emptying and filling waves are mainly influenced by LAA function itself [4]. Even short-lived RAP causes depression in global and regional left atrial systolic function; the recovery period is very short [5]. 16 days of RAP in our animal model resulted in a marked depression of regional left atrial systolic and diastolic function. The changes were completely reversible as late as 4 weeks after the termination of pacing (table 1).

Tab. 1. Doppler echocardiographic variables of LAA function.

	BASAL	AFTER RAP	AFTER 4 WEEKS	P*
LAA-E (m/s)	0.65 ± 0.12	0.26 ± 0.16 *	0.58 ± 0.16	0.001
LAA-f (m/s)	-0.79 ± 0.14	-0.40 ± 0.21*	-0.69 ± 0.13	0.002

All data represent means ± SD. n = 8. LAA, left atrial appendage emptying wave; LAA-f, left atrial appendage filling wave; *p (compared with basal).

The recovery time was therefore much longer for our study group. This supports the concept that the rate of recovery is related to the duration of the preceding RAP [6]. These results suggest that the LAA is mechanically stunned after RAP. Further investigations should focus on the temporal course of changes of LAA systolic and diastolic function during RAP and during the recovery period. The findings could have important implications for anticoagulant therapy in patients with atrial arrhythmias, although LAA is the most usual site of thrombus formation in AF.

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