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Original Article

Measurement of Left Atrial Pressure is a Good Predictor of Freedom From Atrial Fibrillation

Leonard Bergau MD[1], Dirk Vollmann MD[1], Lars Luthje MD[1], Jan Martin Sohns MD[2], Joachim Seegers MD[1], Christian Sohns MD[1]* and Markus Zabel MD[1]*

[1]Dept. of Cardiology and Pneumology, Heart Center, Georg-August-University of Gottingen, Gottingen, Germany
[2]Dept. of Radiology, Georg-August-University of Gottingen, Gottingen, Germany

*Both authors contributed equally to this work

Address for Correspondence: Christian Sohns, MD, Department of Cardiology and Pneumology, Heart Center, Georg-August-University of Gottingen, Robert-Koch-Strasse 40, 37075 Gottingen, Germany. E-Mail: csohns@med.uni-goettingen.de

Abstract

Background: It is suggested that an elevated left atrial pressure (LAP) promotes ectopic beats emanating in the pulmonary veins (PVs) and that LAP might be a marker for structural remodeling. This study aimed to identify if the quantification of LAP correlates with structural changes of the LA and may therefore be associated with outcomes following pulmonary vein isolation (PVI).

Methods: We analysed data from 120 patients, referred to PVI due to drug-refractory atrial fibrillation (AF) (age 63±8; 57% men). The maximum (mLAP) and mean LAP (meLAP) were measured after transseptal puncture.

Results and Conclusions: Within a mean follow-up of 303±95 days, 60% of the patients maintained in sinus rhythm after the initial procedure and 78% after repeated PVI. Performing univariate Cox-regression analysis, type of AF, LA-volume (LAV), mLAP and the meLAP were significant predictors of recurrence after PVI (p=0.03; p=0.001; p=0.01). In multivariate analysis mLAP>18mmHg, LAV>100 ml and the presence of persistent AF were significant predictors (p=0.001; p=0.019; p=0.017). The mLAP >18 mmHg was associated with a hazard ratio of 3.8. Analyzing receiver-operator characteristics, the area under the curve for mLAP was 0.75 (p<0.01). mLAP >18 mmHg predicts recurrence with a sensitivity of 77 % and specificity of 60 %. There was a linear correlation between the LAV from MDCT and mLAP (p = 0.01, R2 = 0.61). The mLAP measured invasively displays a significant predictor for AF recurrence after PVI. There is a good correlation between LAP and LAV and both factors may be useful to quantify LA remodeling.

Keywords: atrial fibrillation, pulmonary vein ablation, predictors, left atrial pressure, remodeling, left atrial volume

Introduction

Atrial Fibrillation (AF) is the most common sustained arrhythmia worldwide with a raising prevalence in the elderly patients. [1] AF is regularly associated with decreased quality of life as well as increased morbidity and mortality [2]. In recent years, catheter based ablation for pulmonary vein isolation (PVI) evolved to be the therapy of choice for treatment of drug refractory AF. Although PVI is successful in most of the patients, the long term success rates vary [3,4]. Long-term efficacy of PVI is depended of multiple factors and still difficult to predict for an individual patient. Further research is essential to assess a large number of reliable predictors offering the opportunity to anticipate the individual risk for AF/AT recurrence following catheter ablation. Previous data suggests that LA-remodeling plays an important role for AF/Atrial tachycardia (AT)-recurrence after PVI. However, LA remodeling is an electrical and anatomical process and therefore difficult to measure directly [5,6]. In this context there is already evidence that the type of AF, LA-dimensions, LA-anatomy and LA-volume may be related to left atrial remodeling and might therefore have the potential to act as significant predictors for AF recurrence after PVI [7,8]. In addition, a recent study discussed that elevated left atrial pressure (LAP) depicts a possible trigger for AF by causing ectopic beats emanating from the pulmonary veins (PVs) [9].

It is still unclear whether elevated LAP has a significant effect on freedom from AF/AT recurrence after PVI and whether this physiological parameter relates directly to anatomical and structural changes of the LA. Our aim was therefore to prospectively analyze if the quantification of LAP is associated with the outcome following PVI.

Methods

Patient selection

120 consecutive patients with drug-refractory, symptomatic paroxysmal or persistent AF were included in this study. All patients underwent PVI between November 2009 and April 2012 at our clinic. All interventions were performed with at least one well-experienced electrophysiologist and usually one or two cardiologists in training. Every patient underwent circumferential isolation using radiofrequency (RF) lesions. All clinical and procedural data were prospectively recorded. Written informed consent was obtained from each patient prior to the ablation procedure and the study was approved by the institutional review board. According to the HRS consensus paper from 2007, paroxysmal AF was defined as self-terminating episodes lasting less than 7 days. Persistent AF was defined as AF lasting more than 7 days, and/or requiring electrical or pharmacological cardioversion [10]. Exclusion criteria were hyperthyroidism, LA thrombus, decompensated heart failure, stroke, myocardial infarction or gastrointestinal bleeding within 4 weeks prior to the intervention. Primary endpoint of this study was defined as long-term procedural success, defined as long-term freedom from any AT/AF episodes irrespective of symptoms after the index procedure during 12 months of follow-up. Secondary endpoints were procedure-related complications defined as death, atrio-esophageal fistulae, pulmonary vein stenosis requiring interventions, pericardial tamponade requiring intervention, phrenic nerve paralysis.

Echocardiography

Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) were routinely performed prior PVI. The TTE images were obtained from parasternal long- and short-axis views, apical four-chamber, two-chamber, and long-axis views. TEE was needed for exclusion of thrombus formation in the atria. All echocardiographies were performed according to the guidelines of the American Society of Echocardiography. [11]