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PERIPHERAL

Atrial Remodeling Following Catheter-Based Renal Denervation Occurs in a Blood Pressure– and Heart Rate–Independent Manner

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CME Objective for This Article: At the completion of this article, the learner should be able to: 1) define resistant hypertension; 2) describe the current status of catheter-based renal sympathetic denervation; and 3) describe remodeling that results from systemic arterial hypertension related cardiac pressure overload.

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ABSTRACT

OBJECTIVES This study sought to investigate left atrial (LA) remodeling in relation to blood pressure (BP) and heart rate (HR) after renal sympathetic denervation (RDN).

BACKGROUND In addition to reducing BP and HR in certain patients with hypertension, RDN can decrease left ventricular (LV) mass and ameliorate LV diastolic dysfunction.

METHODS Before and 6 months after RDN, BP, HR, LV mass, left atrial volume index (LAVI), diastolic function (echocardiography), and premature atrial contractions (PAC) (Holter electrocardiogram) were assessed in 66 patients with resistant hypertension.

RESULTS RDN reduced office BP by 21.6 ± 3.0/10.1 ± 2.0 mm Hg ($p < 0.001$), and HR by 8.0 ± 1.3 beats/min ($p < 0.001$). At baseline, LA size correlated with LV mass, diastolic function, and pro-brain natriuretic peptide, but not with BP or HR. Six months after RDN, LAVI was reduced by 4.0 ± 0.7 ml/kg/m^2 ($p < 0.001$). LA size decrease was stronger when LAVI at baseline was higher. In contrast, the decrease in LAVI was not dependent on LV mass or diastolic function (E/E′ or E/A) at baseline. Furthermore, LAVI decreased without relation to decrease in systolic BP or HR. Additionally, occurrence of PAC (median of >153 PAC/24 h) was reduced (to 68 PAC/24 h) by RDN, independently of changes in LA size.

CONCLUSIONS In patients with resistant hypertension, LA volume and occurrence of PAC decreased 6 months after RDN. This decrease was independent of BP and HR at baseline or the reduction in BP and HR reached by renal denervation. These data suggest that there is a direct, partly BP-independent effect of RDN on cardiac remodeling and occurrence of premature atrial contractions. (J Am Coll Cardiol Intv 2015;8:972–80) © 2015 by the American College of Cardiology Foundation.

Cardiac pressure overload results in cardiac remodeling including myocardial hypertrophy, diastolic dysfunction, and left atrial (LA) enlargement. Renal sympathetic denervation (RDN) represents a novel technique in the treatment of uncontrolled hypertension, documented to reduce office and ambulatory blood pressure (BP) as well as central sympathetic activity in certain patients with uncontrolled hypertension (1). In the randomized, sham-controlled SYMPLICITY HTN-3 study (Renal Denervation in Patients With Uncontrolled Hypertension), the primary safety endpoint was met; however, the primary efficacy endpoint (reduction in office systolic blood pressure between the groups) was not met except in the pre-defined subgroup of Caucasian patients (2). Recently published post-hoc analyses of SYMPLICITY HTN-3 data revealed several potential confounding factors, including weakness in procedural performance, which may partially explain the lower than anticipated response to RDN (3,4). Further research on the effects of RDN on BP and other organ systems is, therefore, warranted given the not fully unambiguous effects in different patient populations and different technical approaches (2).

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Next to its effects on BP, RDN can lower heart rate (HR) in patients with resistant hypertension (5). RDN can also attenuate LV hypertrophy (6), and we previously showed that LV mass regression by RDN occurs independently of BP and HR changes (7); thus, potential BP-independent effects on cardiovascular pathology of RDN have been hypothesized (8). Furthermore, several BP-independent effects of RDN have been described, potentially expanding the range of therapeutic interventions on the sympathetic nervous systems (9–12). There is a direct correlation between myocardial hypertrophy and LA size (13). The latter, if enlarged >34 ml/m^2, is predictive of heart failure (14), ischemic stroke, and death (15). There are reports of LA enlargement independent of blood pressure (16), although a correlation between LA size