Renal denervation and regression of left ventricular hypertrophy

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This editorial refers to ‘Effect of renal denervation on left ventricular mass and function in patients with resistant hypertension: data from a multicentre cardiovascular magnetic resonance imaging trial’, by F. Mahfoud et al., on page 2224.

Effective blood pressure (BP) control in hypertensive patients is still a missed objective, leading to an unacceptably high rate of cardiovascular events. This is particularly true in the case of resistant hypertension. Among the 53 530 stable hypertensive patients with subclinical or established atherothrombotic disease enrolled in the international Reduction of Atherothrombosis for Continued Health (REACH) registry, the presence of resistant hypertension is an independent predictor of cardiovascular morbidity and mortality in essential hypertension, and its reduction during treatment has a favourable prognostic impact. In resistant hypertensive patients the prevalence of LV hypertrophy (LVH) is exceptionally high, ranging from 55% to 81%. This is not surprising, given that the primus movens of LVH is haemodynamic. When BP increases, the resulting increment in wall stress can be offset by an increase in wall thickness; thus, normalization of systolic stress through LVH contributes to maintain a normal ejection fraction despite the high BP levels. However, many factors contribute to cardiac hypertrophy beyond pressure/volume overload (Figure 1). Local angiotensin II can promote LVH acting on both myocardioocytes and cardiac fibroblasts, either directly or activating endothelin-1 and aldosterone pathways. A significant role is played by metabolic factors, such as insulin, insulin growth factors, and lipids, even in non-diabetic hypertensive individuals.

Sympathetic activation is a key player in LVH development. LV mass is significantly related to central sympathetic nerve hyperactivity even in the absence of clinical LVH, indicating that sympathetic activation may be an important determinant of the growth of human LV myocardium. In experimental studies, both functional and chemical (alpha-blockade) sympathectomy have been demonstrated to slow down the process of myocardial interstitial fibrosis occurring in cardiac hypertrophy. However, to date, the role of sympathoinhibition as a mechanism of LV regression has never been clearly demonstrated in humans; in particular, beta-blockade failed to induce LVH regression.

In the past years, device-based therapies for resistant hypertension, specifically targeting the sympathetic nervous system, have been developed. Both renal denervation and baroreceptor-activating therapy demonstrated a rapid and significant reduction of echocardiographic LV mass in small case series. Mahfoud and colleagues have now confirmed those preliminary data by means of cardiac magnetic resonance imaging (MRI) values of LVH would have been interesting, and the authors did not report whether the already published articles about ultrasound LV mass assessment refer to the same patients. This result resembles the discrepancy found between office and 24 h BP reduction achieved by renal denervation and strongly supports the use of objective measurements for assessment of surrogate endpoints in clinical trials. Furthermore, some methodological flaws do not allow us to draw clear conclusions about the impact of renal denervation on LVH regression. The non-randomized design is a major limitation, since the control group is constituted of only 17 patients who did not meet the inclusion criteria of the Symplicity trials: the lack of objective assessment of compliance with drug treatment does not allow LV mass reduction to be attributed to renal denervation with a sufficient degree of certainty. Furthermore, although the authors stated that...
pseudoresistant hypertensive patients were excluded, 24 h BP data were not provided.

Interestingly, a small significant reduction in LV mass was encountered even in non-responder patients (33% of the overall population), i.e. those who showed a systolic BP reduction of < 10 mmHg. This preliminary finding is in line with the hypothesis that in humans sympathoinhibition might be per se a mechanism of LVH regression, regardless of BP reduction. Pharmacological blockade of adrenergic pathways, acting mainly on alpha- and beta-receptors, might be less efficient than inhibition of central drive because of the release of non-adrenergic neurotransmitters. For example, in animal studies, the release of additional sympathetic co-transmitters, such as neuropeptide Y and galanin, during high levels of sympathetic drive can have deleterious consequences even in the presence of beta-adrenergic blockade. In human resistance arteries, sympathetic-mediated forearm vasoconstriction is not completely abolished by beta-blockade, and this effect is at least in part mediated by purinergic transmission. Unfortunately, this study cannot entirely support this intriguing hypothesis. For the demonstration of a BP-independent LVH regression, an accurate LV mass measurement by MRI should have been accompanied by a similarly accurate measurement of BP, by means of 24 h BP recordings. This is particularly important since 24 h BP, rather than office BP reduction, is associated with LVH regression. Furthermore, the small sample size of this subgroup is a major limitation. The demonstration of a BP-independent regression induced by renal denervation would be crucial, particularly after the recent press release announcing that the Symplicity HTN3 trial failed to meet the primary efficacy endpoint, i.e. a pre-determined amount of reduction in office BP after 6 months. Future studies specifically addressing this issue are required, in order to define clearly the role of renal denervation even beyond BP reduction.

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References

Optical coherence tomography imaging of everolimus-eluting bioresorbable vascular scaffold implanted into coronary vein graft at 3-month follow-up

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A 54-year-old male with stable angina, hypertension, and dyslipidaemia, as well as a history of coronary artery bypass grafting with implantation of two saphenous vein grafts to left anterior descending artery (LAD) (Ao-LAD) and diagonal branch (Ao-D1) 23 years ago. Coronary angiography done because of recurrent angina revealed a chronic total occlusion of the right coronary artery, occlusion of Ao-LAD, and significant stenosis of Ao-D1. Quantitative coronary angiography (QCA) showed 92% stenosis of Ao-D1 with its reference lumen diameter of 3.7 mm, minimal lumen diameter (MLD) of 0.3 mm, and lesion length of 11 mm. After pre-dilatation with semi-compliant balloon 2.5 × 8 mm, an everolimus-eluting bioresorbable vascular scaffold (BVS) ABSORB 3.5 × 12 mm (Abbott, Santa Clara, CA, USA) had been implanted with good angiographic results. Acute angiographic results and QCA post-implantation showed MLD of 3.1 and 15% residual stenosis of SVG. Afterwards, the patient had been scheduled for an intravascular optical coherence (OCT) imaging 3 months after the intervention to monitor Ao-D1 healing. OCT revealed complete apposition, no edge dissection or an excessive neointimal hyperplasia in the BVS. The minimal lumen area was 6.2 mm² and the minimal BVS area was 6.7 mm². Moreover, 136 BVS struts were analysed and 71 (52%) of them had been already covered by the neointima. No signs of BVS absorption were detected (Panels A–D, Supplementary material online, Video S1).

This report presents favourable vessel healing after ABSORB implantation to VG in a short-term follow-up. However, further observations are required to monitor the influence of BVS absorption on the VG morphology in a long-term follow-up.

Optical coherence tomography of bioresorbable vascular scaffold implanted into coronary vein graft. Optical coherence tomography (OCT) imaging of ABSORB performed 3 months post its implantation into the Ao-D1, the dashed lines are labelled with numbers that correspond to presented OCT cross sections, dark lines indicate the position of the ABSORB in Ao-D1.

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Supplementary material is available at European Heart Journal online.

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