Editorial

# Renal Denervation in Resistant Hypertension: Radiofrequency Ablation and Chemical Denervation

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Key words:
**Hypertension, renal sympathetic nervous system, chemical denervation, vincristine.**

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Hypertension is a significant and growing public health concern, with an estimated 30-40% of the adult population in the developed world suffering from this condition.[1] Current therapeutic strategies are mainly based on lifestyle interventions and pharmacological approaches, but the rates of control of blood pressure remain unsatisfactory. Recent data suggest that the prevalence of resistant hypertension, defined as blood pressure ≥140/90 mmHg despite the concurrent use of 3 antihypertensive agents, at full doses, one of them being a diuretic, is 12-15% of the treated hypertensive population.[2]

To overcome this problem, novel, catheter-based techniques have been developed that are targeted at the denervation of the renal sympathetic nervous system, a major contributor to the complex pathophysiology of hypertension. In this newly developed approach, a catheter connected to a radiofrequency generator (Symplicity, Ardian Inc., Palo Alto CA, USA) is introduced percutaneously to the lumen of the main renal artery via femoral access and used to disrupt renal nerves located in the adventitia of these arteries. The aim of this technique is to ablate efferent sympathetic and sensory afferent fibres of the renal nerves, both of which are thought to contribute to the blood pressure lowering effect. Although the idea of disrupting the sympathetic innervation of the kidney for the treatment of hypertension is not new, this technique has several advantages compared to the non-selective surgical sympathectomy that has been used previously. It is a minimally invasive approach with short procedural and recovery times and a local application that avoids systemic side effects. Early clinical results demonstrated the efficacy of this technique in producing renal denervation and significant reductions in blood pressure over a 12-month period,[3] while in a randomised controlled trial, with a shorter follow-up period (6 months), 84% of patients achieved a ≥10 mmHg decrease in systolic blood pressure (compared with 35% of controls) and 39% achieved a systolic blood pressure of less than 140 mmHg at six months (compared with 6% of controls).[4] However, radiofrequency denervation has some concerns regarding the possible side effects, which include transient intra-procedural bradycardia, femoral artery psuedoaneurysm, post-procedural hypotension, urinary tract infection, paraesthesia, and pain,[5] as well as the regenerative potential of the afferent sensory fibres of the renal nerves.[6]

Renal denervation can be performed not only by radiofrequency ablation but also by the local application of agents that are

known to have a neurotoxic effect, such as vincristine.

Vincristine is an anti-neoplastic drug with a broad spectrum of activity against haematological malignancies and childhood sarcomas. The main side-effect of vincristine is neurotoxicity by causing giant axonal swellings and secondary demyelination of the paranodal type, mainly in the proximal portions of the peripheral nerves outside the spinal canal. Experimental data from our institute, regarding the use of vincristine for the chemical denervation of the renal artery were presented at the recent TCT 2011 congress (San Francisco, USA) and showed that this method is safe and effective. Vincristine was locally delivered in the vascular wall of swine renal arteries, by means of a modified balloon catheter, and resulted in renal sympathetic denervation. Thirty days after the index procedure, immunohistology revealed that the mean number of intact nerves in all sections was significantly lower in the vincristine group compared to controls. Although this study gave no data regarding the regeneration of the sympathetic nervous system, the prolonged neurotoxicity of vincristine that has been reported in patients with sarcomas may give chemical denervation with vincristine an advantage in the long-term treatment of resistant hypertension (Stefanadis et al, Chemical denervation of the renal artery by vincristine in swine. A new catheter based technique: under revision).

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