Renal Sympathetic Denervation for Resistant Hypertension - A Novel Treatment Strategy

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Abstract

Uncontrolled Hypertension (HTN) accounts for significant morbidity and mortality. Despite newer drugs hypertension remains uncontrolled in approximately a third of the patients. The overall prevalence of hypertension in adults > 20 years was 30% in men and 34% in women in 2002. We report 2 patients with uncontrolled hypertension in whom Renal denervation therapy improved the control of blood pressure.

Introduction

Blood pressure (BP) remains uncontrolled despite availability of several drugs in over third of the hypertensives.¹ ² This results in increased risk of cardiovascular and cerebrovascular complications. Renal denervation therapy (RDN) with the help of radiofrequency ablation is a novel therapy which has emerged as a treatment modality for these patients. We report our experience in 2 patients with refractory hypertension in whom RDN helped to achieve BP control.

Case 1

42 year old male with a history of long standing hypertension presented with headache and giddiness. On examination his BP was 160/100 mmHg. Patient was a non smoker, and reported occasional consumption of alcohol. He was on Telmisartan 40 mg twice a day with hydrochlorothiazide 12.5 mg and Amlodipine 10 mg twice a day. His lab investigations and urine analysis were normal. Renal artery Doppler study was normal. Despite regular use of medications his blood pressure remained poorly controlled. In view of uncontrolled BP renal denervation was done in this patient.

After informed consent bilateral renal angiogram was performed and a road map of both the renal arteries was obtained. A 6F deflectable ablation catheter (Celisus, J and J.) was advanced through a pre shaped sheath and positioned in the left renal artery. Six radiofrequency (RF) lesions were delivered circumferentially in different planes in the temperature control mode (10 wats and 60° C). Procedure was repeated within the right renal artery. Selective Renal angiogram after the procedure revealed normal renal arteries. There was progressive reduction of BP (Figure 1) which came down to 110/70 by 3rd day. Patient’s anti hypertensive medications were reduced to Amlodipine 5 mg once daily. His BP remains controlled with a single drug during 3 months follow up. Patient’s renal function remains normal.

Case 2

A 28 year old lady, with chronic kidney disease was on maintenance...
Haemodialysis presented to us with uncontrolled hypertension. She was on prazosin, nebivolol, telmisartan, hydrochlorothiazide and clonidine. Patient was admitted with a BP of 240/140 mmHg severe headache and vomiting. She was started on IV Nitroglycerine drip and titrated according to blood pressure. She was dialysed adequately and was euvoalaemic clinically. Patients blood pressure remained uncontrolled despite a high dose of nitroglycerine (Figure 2). Patient’s pre procedure creatinine was 7.0.

After informed consent bilateral renal angiogram was performed and the road map was obtained. Arterial access was obtained from right femoral artery and Renal Denervation (RDN) was performed using RF energy along the renal arteries on both sides as described above.

Post procedure patient’s BP steadily improved (Figure 2) and was discharged after 3 days in a stable condition. Patients post procedure creatinine was 8.0. and was dialysed following the procedure. Patient was maintaining blood pressure within normal range on two drugs after 3 months follow up.

Discussion

Resistant hypertension is defined as uncontrolled blood pressure despite the use of optimal doses of three antihypertensive agents, of which one is a diuretic. Prevalence of resistant hypertension can be as high as 30%. Several factors contribute to “resistant hypertension” like poor patient compliance to drugs, physician inertia to optimise the doses, inappropriate drug combinations or inadequate dosing, drug-interactions, and secondary causes. In addition several limitations of drug therapy (cost, adverse effects, polypharmacy, etc.), create the need for other therapeutic options, such as devices and interventions.

According to studies sympathectomy was found to be very effective in reducing blood pressure, and results were maintained in the long term. Selective renal sympathetic denervation (RSD) is a recent form of therapy attempting to interrupt the influence of the sympathetic nervous system on the kidney and helps in controlling the blood pressure.5

The kidney is richly innervated with baroreceptors and chemoreceptors.6 Sympathetic outflow from hypothalamus is stimulated by renal afferent nerve projections, which cause rises of blood pressure and systemic vascular resistance.7 In patients with end stage renal disease this CNS input from renal afferent nerves is crucial for production of the sympathetic activation and hypertension, and is reduced after therapeutic nephrectomy.8 Renal sympathetic nerves arise from T10 to L1, follow renal artery to the kidney and primarily lie within the adventitia. It was found that bilateral dorsal rhizotomy at the level T-10 to L-3 resulted in almost complete normalisation of BP in 5/6 nephrectomised rats.9

Reduction of the kidney’s contribution to central sympathetic outflow is important. Renal denervation reduces whole-body noradrenaline spillover and also reduces sympathetic nerve impulses to the skeletal muscle vasculature, which can be measured by muscle sympathetic nerve activity after renal sympathetic denervation.10 Renal denervation reduces renal sympathetic efferent activity, as shown by reduction in renal noradrenaline spillover measurements.10,11 Renal denervation is also accompanied by an increase in renal blood flow and reduction in plasma renin activity.10

Renal denervation therapy is safe and effective in patients with treatment resistant hypertension. It helps to achieve good blood pressure control in selected patients.
References


