

## Case Report

# Case of a 56 year old female with long-standing resistant hypertension and referred at our cardiac centre for catheter-based radiofrequency renal denervation

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### ABSTRACT

A 56 -year-old female with long-standing resistant hypertension to treatment with a combination of seven different drugs, referred for catheter-based radiofrequency renal denervation (RDN). A radial access was chosen because the patient was very obese and of short stature. This described renal denervation through the radial artery might represent an alternative for patients in whom femoral access is a higher-risk option, such as very obese patients and patients with peripheral artery disease or with a higher bleeding risk. Nevertheless, with the current available system, this approach is difficult and cannot be widely used, not only because of the length but also because of the stiffness of the catheter.

**Keywords:** Resistant hypertension, Catheter based renal denervation

## INTRODUCTION

Patients referred for renal denervation (RDN), who have high blood pressure values and are often obese, have a high risk of femoral access bleeding complications. Therefore, the radial approach might constitute a potential useful alternative. We report a case of radiofrequency renal denervation performed via radial artery access. Catheter-based renal denervation is a novel device-based treatment for drug-resistant hypertension. The first available radiofrequency denervation systems were developed for use by femoral access. This has been shown to be effective and safe in clinical trials, and the most reported complications have been related to the access site.<sup>1,2</sup>

## CASE REPORT

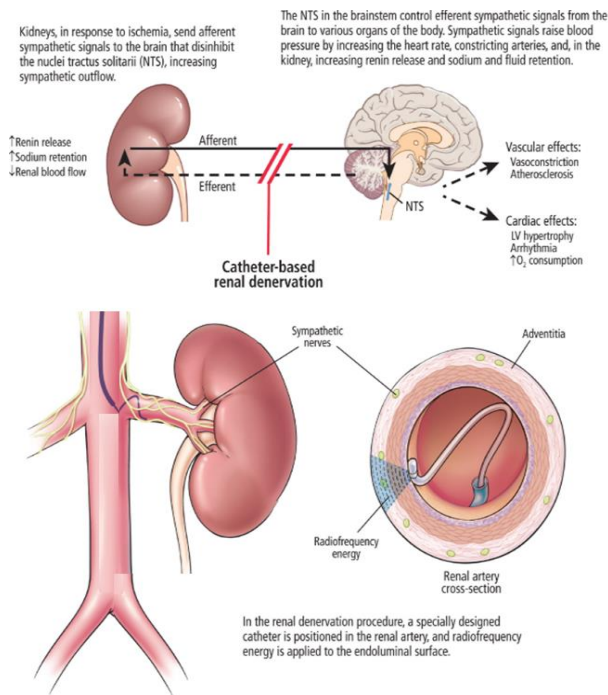
We describe the case of a 56-year-old female with long-standing essential hypertension that was resistant to treatment with a combination of 7 different drugs at maximal tolerated doses, including spironolactone (Table 1). Besides resistant hypertension, other cardiovascular risk factors included type 2 diabetes mellitus, dyslipidemia, and obesity (body mass index, 42 kg/m<sup>2</sup>). Target organ damage included left ventricular hypertrophy (left ventricular mass index, 126 g/m<sup>2</sup>) with normal ejection fraction as well as previous history of coronary artery disease, with percutaneous coronary intervention (PCI) of the mid left anterior descending for stable angina. Renal function was normal (MDRD estimated glomerular filtration rate, 67 mL/min/1.73 m<sup>2</sup>)

and there were no previous cerebrovascular events, peripheral arterial disease, or retinopathy.

**Table 1: Journey of antihypertensive drugs before and after RDN.**

Medication	2011	2013 before RDN	2013, 6 months after RDN	2015
Amlodipine XL, mg	30	30	10	10
Ramipril, mg	5	10	...	...
Hydrochlorothiazide, mg	25	25	12.5	12.5
Furosemide, mg	40	80	20	
Bisoprolol, mg	10	10	2.5	...
Prazosin, mg	15	15	...	...
Spirolactone, mg	25	50		

\*RDN - indicates renal denervation.



**Figure 1: Renal denervation procedure diagram.**

Mean office blood pressure was consistently above 172/98 mm Hg and mean 24-hour ambulatory blood pressure monitoring (ABPM) was 193/96 mm Hg (diurnal) and 184/86 mm Hg (nocturnal). Based on this history and concomitant antihypertensive drug therapy with 6 different agents, the patient was considered to have severe resistant hypertension and was referred for catheter-based radiofrequency renal denervation. Given the risk of femoral access complication in this very obese patient and because she was of short stature (height, 150 cm), radial access was chosen. Renal artery angiography excluded the presence of significant stenosis and anatomical variants, namely accessory polar arteries. Renal artery diameter was >4 mm and the only

remarkable observation was a short main left renal artery. Under mild sedation and analgesia consisting of continuous infusion of propofol and remifentanyl, a 6 Fr sheath was inserted into the left radial artery using the standard percutaneous technique and a heparin bolus of 100 U/kg was administered intravenously. A 6 Fr Judkins right (JR) catheter was used for ablation catheter introduction. However, since the length of the simplicity radiofrequency catheter (Medtronic, Inc) was shorter than the guiding catheter, the guide catheter was cut to an appropriate length and the proximal end was corrected with the interposition of a 5 Fr sheath (Figure 1).

This “customized” JR catheter was then inserted in an attempt to engage the right renal artery. Despite this adjustment, we were unable to advance the radiofrequency catheter due to the closed angle of the left subclavian artery.

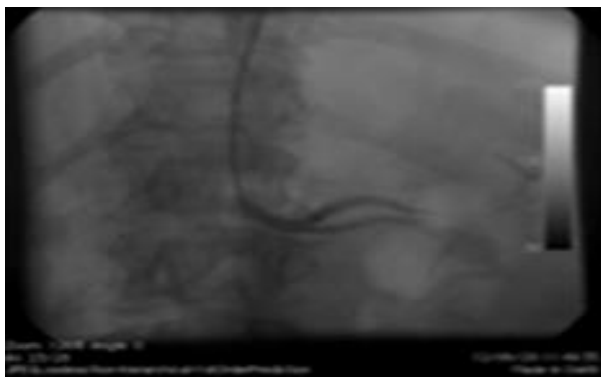


**Figure 2: Symplicity radiofrequency catheters to perform the renal denervation in left renal artery.**

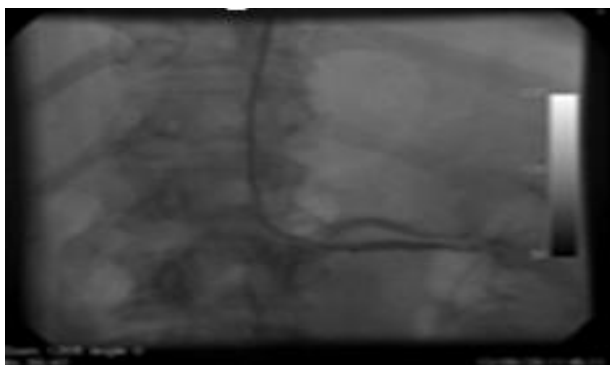
After changing to right radial artery access, we were able to successfully advance both the customized 6 Fr JR and the Symplicity radiofrequency catheters to perform the renal denervation (Figure 2). Five radiofrequency treatments were applied to the right renal artery, whereas just 3 energy applications were performed in the left renal artery, since this artery had a shorter length to the first bifurcation (Figures 3-5).



**Figure 3: Radiofrequency catheter inside the ostium of left renal artery.**



**Figure 4: Radiofrequency 3 energy applications were performed in the left renal artery proximal part.**



**Figure 5: Radiofrequency 3 energy applications were performed in the left renal artery, since this artery had a shorter length to the first bifurcation.**

The radiofrequency applications were performed from distal to proximal, with a minimum separation of 5 mm. The duration of each application was 2 minutes at 8 Watts maximum, consistent with a previously published standard protocol. No signs of renal artery abnormality were apparent at the control renal angiographies and no complications related to the radial access were observed. The patient was discharged from the hospital the day following the procedure. At the 3 month follow up exam, there was a significant drop in blood pressure, with mean 24 hour ABPM of 167/76 mm Hg (diurnal) and 169/73 mm Hg (nocturnal), without any changes in the number of antihypertensive drugs. There were no significant changes in renal function. After 6 months of RDN her blood pressure was on target with required 4 antihypertensive agents and after 2 years of RDN she became happy with 142/84 mmHg blood pressure with support of only amlodipine plus hydrochlorthiazide combination pill (Table 1).<sup>4</sup>

## DISCUSSION

To the best of our knowledge, this is the first report of a successful catheter-based radiofrequency renal denervation performed by radial artery access. Catheter-based renal denervation for resistant hypertension with the Symplicity renal denervation system has been shown

to be an effective and very safe procedure. Indeed, most reported complications have been related to the access site.<sup>1,2</sup> This might be expected, since high blood pressure is a predictor of access-site complications. In the present case, the patient had multiple risk factors for pseudo aneurysm formation; including female gender, older age, diabetes, and obesity.<sup>3</sup> This described “off-label” application of approved devices through the radial artery might represent an alternative for patients in whom femoral access is a higher-risk option, such as very obese patients or patients with peripheral artery disease. On the other hand, a radial approach could also be a suitable alternative for patients with a higher bleeding risk, since radial access is associated with lower bleeding rates.<sup>4</sup> Nevertheless, with the current available system, this approach is difficult and cannot be widely recommended, not only because of the length but also because of the stiffness of the catheter. In the future, newer systems might overcome these issues.

## CONCLUSION

This case report describes the feasibility of a catheter-based radiofrequency renal denervation for resistant hypertension, performed by radial access. This approach was chosen to avoid the potential risk of femoral bleeding complications in a very obese patient with severe resistant hypertension. The difficulties experienced with this approach, related to the length and the stiffness of the presently available radiofrequency catheter, might prevent it from being widely used via radial access.

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