CLINICAL IMAGE

First-in-man experience with renal denervation of multiple renal arteries in a patient with solitary kidney and resistant hypertension

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Intravascular renal sympathetic denervation (RSDN) has been widely studied as an alternative or adjunctive treatment for patients with resistant hypertension.[1,2] We present a very rare case of a patient with 3 main renal arteries (RAs) supplying a solitary kidney, who

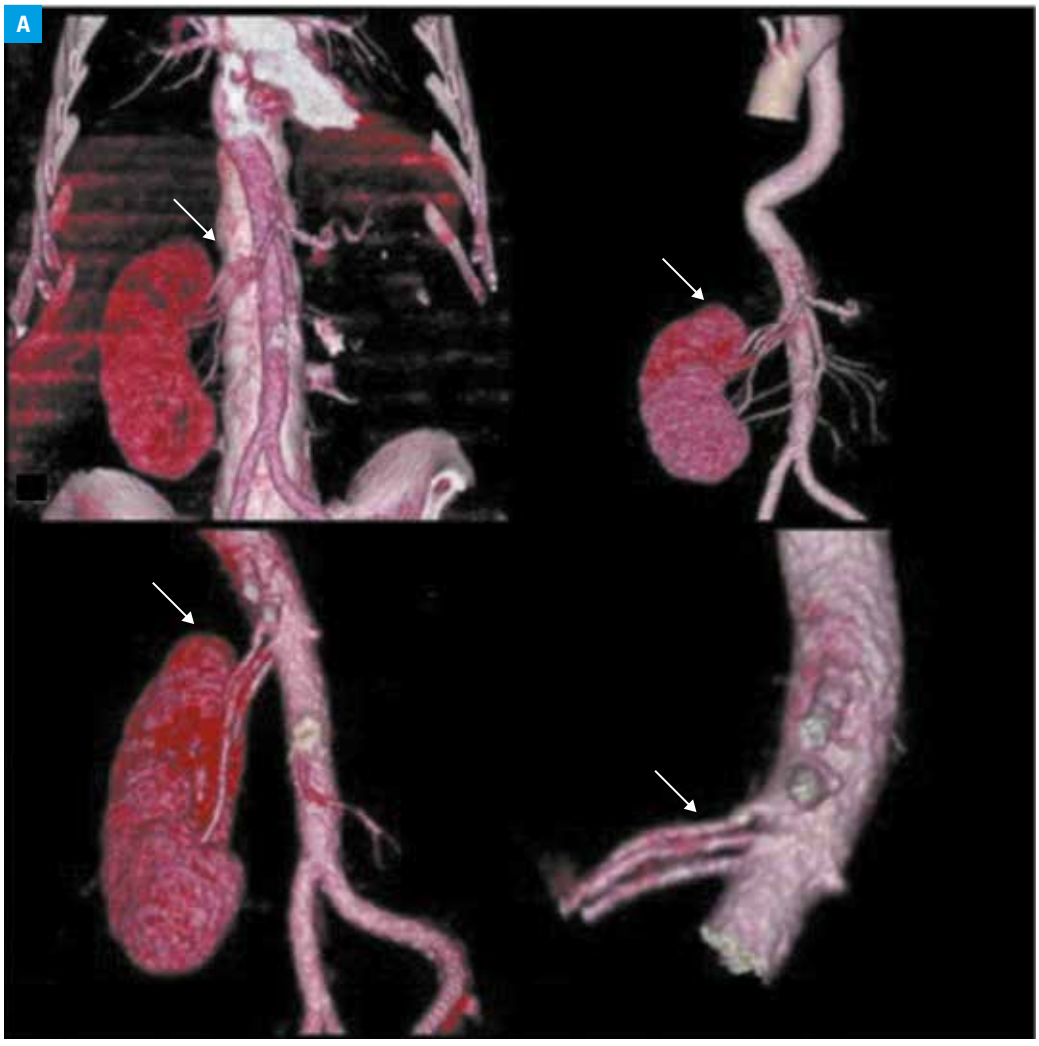

FIGURE 1 **A** – abdominal computed tomography scans showing a kidney with 3 renal arteries (arrows)

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Received: October 20, 2016.
Revision accepted: January 2, 2017.
Published online: January 31, 2017.
Conflict of interest: none declared.
Pol Arch Intern Med. 2017; 127 (1): 60-62
doi:10.20452/pamw.3912

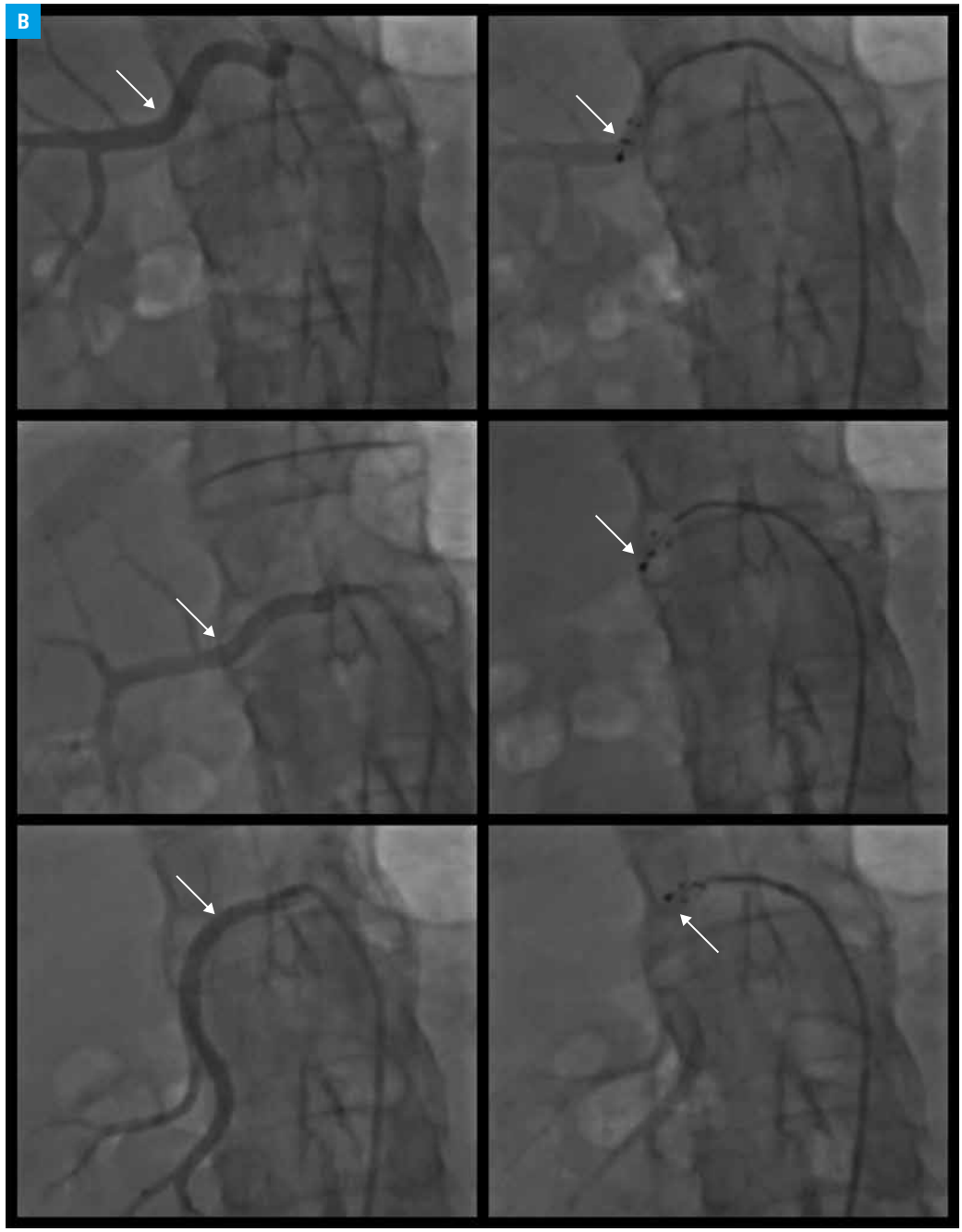

FIGURE 1 **B** – renal denervation procedure performed in 3 separate renal arteries (arrows)

underwent a successful RSDN due to true resistant hypertension.

A 60-year-old white male patient with treatment-resistant essential hypertension, obesity (body mass index [BMI], 44.8 kg/m^2), type 2 diabetes, and a history of 2 ischemic strokes and left-sided nephrectomy for kidney cancer presented to our department for modification of antihypertensive treatment. Despite optimizing nonpharmacologic and pharmacologic treatment with 5 antihypertensive medications in full daily doses (valsartan, 320 mg; hydrochlorothiazide, 25 mg; doxazosin, 8 mg; nitrendipine, 40 mg; and carvedilol, 37.5 mg), blood pressure (BP) control was not satisfactory. Home BP monitoring revealed mean BP values of 190/110 mmHg. Similarly, ambulatory BP monitoring revealed unsatisfactory BP control, with the mean values of 179/102 mmHg during daytime and 156/83 mmHg during the sleeping period. A transthoracic echocardiogram showed left ventricular hypertrophy with a posterior wall diastolic diameter (PWDd) of 14 mm.

Subsequent imaging and laboratory tests excluded potential secondary systemic hypertension, target organ damage, as well as cardiac and renal complications, confirming that the patient had true resistant hypertension. Despite nephrectomy and multiple risk factors for atherosclerosis, kidney function was not impaired (estimated glomerular filtration rate [eGFR], 95 ml/min/1.73 m^2).

An abdominal computed tomography scan performed prior to the procedure additionally revealed 3 RAs, each originating independently from the aorta (the upper artery, 83-mm long with a 4.5-mm diameter supplying the upper kidney pole; the middle artery, 110-mm long with

a 4-mm diameter supplying the lower kidney pole; and the lower artery, 85-mm long and a diameter of 4.3 mm; FIGURE 1A). We decided that the patient was more likely to benefit from RSDN as the best therapeutic option at that time rather than from further treatment intensification. RSDN was performed using 6 radiofrequency energy pulses in each RA in a spiral pattern (FIGURE 1B).

There were no immediate or late complications of the procedure, and normal kidney function was preserved (25 months after RSDN, the serum creatinine concentration was 0.92 mg/dl, with an eGFR of 89 ml/min/1.73 m^2). After 25 months of follow-up, the patient was treated with valsartan (320 mg), hydrochlorothiazide (25 mg), nitrendipine (10 mg), and carvedilol (25 mg); compared to pre-RSDN treatment, the dose of nitrendipine was reduced and doxazosin was discontinued 3 months after the procedure (no significant decrease in BMI was noted). Repeated ambulatory BP monitoring at 25 months revealed a notable BP reduction to a mean value of 128/73 mmHg (129/75 mmHg during awake hours and 125/70 mmHg during the sleeping period). Unfortunately, the PWDd was still around 14 mm.

There are few data on the efficacy and safety of RSDN in patients with multiple RAs and solitary kidney. The presence of multiple RAs is common and ranges from 10% to 60%. Moreover, multiple or accessory RAs occur more frequently in hypertensive patients and increase the risk of hypertension.[3] In the SYMPLICITY HTN-1 and HTN-2 trials, such patients were excluded.[4,5] In the Global SYMPLICITY Registry, patients with multiple RAs (mean number, 2.2 ±0.6) and undergoing the procedure were included, but it still showed a very limited number of cases with more than 2 RAs.[6] However, we identified no trials investigating the use of RSDN in a patient with a solitary kidney and multiple main RAs, thus we believe that our case is a first-in-man experience in this clinical setting. This successful case is even more interesting in the light of SYMPLICITY HTN-3 trial, which failed to confirm the effectiveness of RSDN. Although the study included a sham procedure, limitations included ineffective or inconsistent results associated with the lack of experience of interventionalists in the RDN procedure, medication changes both between screening visits and before assessment of 6-month endpoints (in about 40% of the patients), variable drug adherence, and the lack of validated tests to confirm renal denervation.[6] Moreover, in non–African-American population treated with RSDN, there was a significant reduction of BP values compared with the sham group (–15.2 vs –8.6 mmHg, respectively; $P = 0.012$).[7]

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