Treating Refractory Hypertension: Renal Denervation With High-Resolution 3D-Angiography

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ABSTRACT
A 53-year-old male was referred to our Department for refractory primary hypertension. Despite high doses of 6 anti-hypertensive drugs, ambulatory monitoring of blood pressure (BP) revealed a mean BP of 160/90 mmHg. Under local anaesthesia, renal denervation with radiofrequency was performed supported by high-resolution 3D angiography, which helped confirm the position of the applications in a spiroid fashion.

Keywords: Hypertension; Cardiovascular Disease; Denervation; Angiography

1. Introduction
High blood pressure is an independent cardiovascular risk factor with high prevalence (1). Precisely, hypertension can lead to ischemic heart disease (myocardial infarction), heart failure, stroke, dementia and chronic kidney disease (2). Despite physical exercise, dietary recommendations and pharmacological therapy, up to 50% of hypertensive patients do not achieve adequate blood pressure control (2). Clinical and experimental studies have shown a sympathetic activation with positive feedback as a physiopathological mechanism leading to hypertension and contributing to maintaining high blood pressure (3-5). Endovascular treatment with low dose radiofrequency in the renal arteries (renal denervation) has shown to be effective reducing sympathetic activation of efferent nerves, involved in hypertensive responses (6-9). Moreover, this technique has been shown to have prolonged predictable effects and low incidence of complications (mainly vascular access-related) (6). Blood
pressure reduction has been effective in more than 85% of the subjects treated with renal denervation, adequately selected (systolic blood pressure > 160 mmHg despite > 4 antihypertensive drugs including diuretics), obtaining a reduction > 10 mmHg in systolic blood pressure (6, 7). Imaging techniques are continuously improving to help interventionalists conduct this novel technique (6). We discuss the contribution of different imaging modalities to the success of the procedure.

2. Case Report

A 53-year-old Caucasian male was referred to our Department for refractory primary hypertension. Despite high doses of six anti-hypertensive drugs (Enalapril, Doxazosin, Hidroclorotiazide, Spironolactone, Amlodipine, Atenolol), ambulatory monitoring of blood pressure (BP) revealed a mean BP of 160/90 mmHg. Exhaustive blood tests, CT scan and renal arteries ultrasound suggested primary hypertension as the most probable diagnosis (Figure 1). Coronary CT scan ruled out significant coronary heart disease (Figure 2). Under local anaesthesia and after informed consent, renal denervation with radiofrequency was performed supported by high-resolution 3D angio- graphy (Figure 1C), which helped confirm the position of the applications with Ardián’s Simplicity Catheter (Minneapolis, MN, USA) in an spiraloid fashion and negotiate properly the curve of the right renal artery. 3D angiography was obtained after continuous contrast injection and 360° angiographic acquisition using a single-plane Phillips Allura Xper FD20, with XperSwing technology. Six weeks after the procedure, the patient has recovered without complications and systolic blood pressure has dropped 20 mmHg, measured by 24-hour ambulatory recording of blood pressure.

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Authors Contribution
EA-B, MS-M: conception and design EA-B, MC, RT, MV: processing the images EA-B, CDD, RM: drafting of the manuscript EA-B, RM, MS-M: final approval of the manuscript submitted.
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