Rev Bras Cardiol Invasiva.
2013;21(2):109-14

Original Article

Renal Sympathetic Denervation for Treatment of Resistant Hypertension

Carlos Adolfo Collet[1], Juan Simon Muñoz[2], Oscar Sanchez[3], Roberto Correa[4], Pedro Aguiar[5], Rosalin Vasquez[6], Alejandro Sanchez[7], Hector Marcano[8], Olga Azuaje[9], Maritza Duran[10], Julio Guerrero[11], Guilherme F. Attizzani[12], Carlos Dávila[13], Francisco Tortoledo[14]

ABSTRACT

Background: Systemic arterial hypertension affects over 1.2 million people worldwide. Only 35% of hypertensive patients have controlled blood pressure levels. Renal sympathetic denervation (RSD) has shown to significantly decrease blood pressure levels in patients with resistant systemic hypertension. **Methods:** Prospective, single arm, observational, multicenter study including consecutive patients undergoing RSD. The primary endpoint was to assess systolic blood pressure levels at the 30-day follow-up. The secondary endpoint was to determine the presence of procedure-related adverse events. **Results:** The first 20 patients undergoing RSD were included. The average blood pressure prior the procedure was 171.6/93.2 ± 15.5/11.3 mmHg, with the use of 4.1 ± 1.5 antihypertensive drugs per patient. Success rate was 95%, and 11.1 ± 1.9 ablations were performed per patient. A systolic blood pressure decrease of 29 ± 21 mmHg (P = 0.009) was observed 30 days after the procedure. There were no procedure-related complications. **Conclusions:** Catheter-based RSD in daily clinical practice patients significantly decreased blood pressure levels. In our experience, RSD proved to be feasible and safe.

DESCRIPTORS: Hypertension. Kidney. Sympathectomy. Catheters.

RESUMO

Denervação Simpática Renal para o Controle da Hipertensão Arterial Resistente

Introdução: A hipertensão arterial sistêmica afeta mais de 1,2 milhão de pessoas no mundo. Apenas 35% dos pacientes hipertensos têm valores de pressão arterial controlados. Recentemente a denervação simpática renal (DSR) tem demonstrado diminuir significativamente os valores de pressão arterial nos pacientes com hipertensão arterial sistêmica resistente. **Métodos:** Estudo prospectivo, de braço único, observacional, multicêntrico, incluindo pacientes consecutivos submetidos a DSR. O objetivo primário foi avaliar os níveis da pressão arterial sistólica aos 30 dias de seguimento. O objetivo secundário foi determinar a ocorrência de qualquer evento adverso relacionado com o procedimento. **Resultados:** Foram incluídos os primeiros 20 pacientes submetidos a DSR. A média de pressão arterial antes do procedimento foi de 171,6/93,2 ± 15,5/11,3 mmHg, com média de uso de 4,1 ± 1,5 fármacos anti-hipertensivos por paciente. A taxa de sucesso foi de 95%, tendo sido aplicadas 11,1 ± 1,9 ablações por paciente. Foi observada diminuição média de 29 ± 21 mmHg (P = 0,009) na pressão arterial sistólica 30 dias após o procedimento. Não houve complicação associada ao procedimento. **Conclusões:** A DSR por cateter em pacientes da prática clínica diária diminuiu significativamente os valores de pressão arterial. Em nossa experiência, a DSR demonstrou ser factível e segura.

DESCRITORES: Hipertensão. Rins. Simpatectomia. Cateteres.

[1] Interventionist Cardiologist Physician, Director of Cardiovascular Research Center Caracas. Caracas, Venezuela.
[2] Interventionist Cardiologist Physician, Director of Cardiovascular Research Center Caracas. Caracas, Venezuela.
[3] Interventionist Cardiologist Physician at the Invasive Cardiology Service of Instituto Médico La Floresta. Caracas, Venezuela.
[4] Interventionist Cardiologist Physician at the Invasive Cardiology Service of Centro Médico de Caracas. Caracas, Venezuela.
[5] Interventionist Cardiologist Physician at the Invasive Cardiology Service of Instituto Médico La Floresta. Caracas, Venezuela.
[6] Médica cardiologista da Clínica El Ávila. Caracas, Venezuela.
[7] Interventionist Cardiologist Physician at the Invasive Cardiology Service of Instituto Médico La Floresta. Caracas, Venezuela.
[8] Cardiologist Physician at Clínica El Ávila. Caracas, Venezuela.
[9] Cardiologist Physician at Instituto Médico La Floresta. Caracas, Venezuela.
[10] Cardiologist Physician at Clínica El Ávila. Caracas, Venezuela.
[11] Cardiologist Physician at Instituto Médico La Floresta. Caracas, Venezuela.
[12] Interventionist Cardiologist Physician, Resident in Structural Interventions at Universidade de Catânia. Catânia, Italy.
[13] Interventionist Cardiologist Physician, Director of the Invasive Cardiology Service of Clínica El Ávila. Caracas, Venezuela.
[14] Interventionist Cardiologist Physician, Director of the Invasive Cardiology Service of Instituto Médico La Floresta. Caracas, Venezuela.

Correspondence to: Carlos Adolfo Collet. Clínica El Ávila – Av. San Juan Bosco, Piso 6 – Caracas, Venezuela – CEP 1082
E-mail: carloscollet@gmail.com

Received on: 03/01/2013 • Accepted on: 05/12/2013

Rev Bras Cardiol Invasiva.
2013;21(2):109-14

Systemic arterial hypertension (SAH) affects over 1.2 million people worldwide, with a prevalence of 28% in the adult population.[1,2] The consequences and progressive damage of SAH on target organs reduce patient survival, accounting for half of coronary and cerebrovascular events.[3,4]

Adequate control of SAH reduces the occurrence of adverse events. A 5 mmHg reduction in the systolic blood pressure is associated with a 10% decrease in relative risk of death from cerebrovascular causes and acute coronary syndrome. Conversely, a 20 mmHg increase in systolic blood pressure doubles the risk of mortality from cardiovascular causes.[5] However, only 35% of hypertensive patients have blood pressure values within the targets proposed by the guidelines,[5] in most cases due to poor adherence to prescribed treatment, suboptimal treatment, or secondary causes of SAH. However, approximately 10% of patients with appropriate use of three or more antihypertensive drugs do not manage to control their blood pressure levels; this group of patients, known as resistant hypertensive patients, have a high risk for the occurrence of adverse cardiovascular events.[6]

In the resistant hypertensive population, studies using microneurography and measurement of blood catecholamines demonstrated the participation of the sympathetic nervous system in the genesis and maintenance of SAH.[7-9] Surgical sympathectomy was shown to be effective in reducing blood pressure in patients with resistant SAH; however, this technique was abandoned due to high rates of complications.[10-12] More recently, a less invasive approach with percutaneous renal sympathetic denervation performed by applying radiofrequency to the renal artery wall was shown to decrease adrenergic tone, release of norepinephrine, and blood pressure.[13] Catheter-guided (Symplicity®, Ardian Medtronic – Minneapolis, USA) renal sympathetic denervation was tested in the clinical trials Symplicity HTN-1-first-in-man and Symplicity HTN-2, presenting a significant and sustained decrease in systolic blood pressure.[13,14] Recently, this system was made available for clinical use in Venezuela, initiating the authors' experience with this procedure.

This study aimed to describe the characteristics of patients undergoing renal sympathetic denervation, as well as to evaluate the efficacy and safety of the procedure in daily clinical practice.

METHODS

Renal sympathetic denervation system

The components of the renal sympathetic denervation system are the Symplicity® catheter and radiofrequency generator. The generator consists of two parts: the console and the pedal (Figure 1). The generator produces energy through radiofrequency, following a predetermined algorithm. During the radiofrequency application, voltage, temperature, and impedance of the application point on the renal artery are continuously monitored and controlled. The maximum voltage is 8 W, and the system generates energy with impedances between 20 ohms and 500 ohms. The Symplicity® catheter, compatible with 6 Fr, applies radiofrequency energy to the renal artery wall. It comprises the handle lever and a flexible portion, 108 cm long, with a platinum monopolar electrode at the tip, with two radiopaque marks 5 mm apart from each other. By manipulating the handle lever, the catheter tip can be flexed and/or rotated to reach the correct position for the application of radiofrequency (Figure 2).

Procedure

An abdominal aortography was performed by femoral approach to assess the renal arteries and the technical feasibility of the procedure. Subsequently, the renal arteries were selectively catheterized, and the Symplicity® catheter was advanced within the vessel. Four to eight ablations were applied from the distal to the proximal portion, 5 mm apart, with duration of 120 seconds in both renal arteries (Figure 3). Each radiofrequency application has a maximum of 8 W and increases in impedance and temperature are controlled

Figure 1 – Radiofrequency generator of the Symplicity system.

Figure 2 – Symplicity® Catheter.