Archives of Cardiovascular Disease (2014) 107, 690—696

Available online at ScienceDirect www.sciencedirect.com

Elsevier Masson France EM|consulte www.em-consulte.com/en

REVIEW

Baroreceptor stimulation for resistant hypertension: First implantation in France and literature review

Stimulation des barorécepteurs carotidiens comme traitement de l'hypertension artérielle : premier cas en France et revue de la littérature

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Received 1st July 2014; received in revised form 28 August 2014; accepted 29 August 2014
Available online 16 October 2014

KEYWORDS
Baroreflex;
Baroreceptor activation therapy;
Sympathetic nervous system;
Resistant hypertension

Summary Despite a wide choice of effective antihypertensive treatments, blood pressure (BP) in roughly half of hypertensive subjects is not controlled. Resistant hypertension is defined as an uncontrolled BP despite optimal doses of three antihypertensive treatments, including a diuretic. After confirmation of resistant BP using home BP measurement or 24-hour ambulatory BP monitoring (ABPM), patients usually go through a work-up to rule out secondary hypertension. If secondary hypertension is ruled out, the recent European guidelines on hypertension consider baroreceptor stimulation or renal denervation to be possible options. The prevalence of resistant primary hypertension may reach up to 10% in specialized centres. The two proposed non-pharmacological therapeutic strategies have been developed recently to inhibit

Abbreviations: ABPM, ambulatory blood pressure monitoring; BAT, baroreceptor activation therapy; BP, blood pressure; CT, computed tomography; DBP, diastolic blood pressure; LVEF, left ventricular ejection fraction; SBP, systolic blood pressure.

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http://dx.doi.org/10.1016/j.acvd.2014.08.002

sympathetic overactivity in resistant hypertension. Among them, baroreceptor activation therapy (BAT) is an innovative approach that interferes with baroreflex function. The first-generation BAT device (Rheos®; CVRx, Inc., Minneapolis, MN, USA) demonstrated good efficacy in lowering office BP and ABPM, but had an insufficient safety profile due to complex surgery. The second-generation BAT device (Barostim *neo*™ system; CVRx, Inc.) seems to share the same BP-lowering efficacy but has a better safety profile. We report the first French case of baroreceptor stimulation for hypertension using the Barostim *neo*™ system. We also discuss the pathophysiological features of and current levels of evidence for this technique.

MOTS CLÉS
Baro-réflexe ;
Traitement activateur des barorécepteurs ;
Système nerveux sympathique ;
Hypertension artérielle résistante

Résumé Malgré la disponibilité de nombreuses classes d'anti-hypertenseurs, la moitié des patients hypertendus ne sont pas contrôlés. L'hypertension résistante se définit par une pression artérielle non contrôlée malgré l'utilisation de trois anti-hypertenseurs à doses optimales dont un diurétique. Après confirmation par auto-mesures ou holter tensionnel, les patients ayant une hypertension résistante doivent bénéficier d'un bilan complet à la recherche de formes secondaires. La prévalence de l'hypertension essentielle résistante est de l'ordre de 5 à 10 % dans les centres spécialisés. Les recommandations européennes proposent la stimulation des barorécepteurs ou la dénervation rénale en cas d'hypertension non contrôlées par les mesures pharmacologiques. Ces deux approches non pharmacologiques ont été développées récemment pour cibler l'hyperactivation du système nerveux sympathique dans l'hypertension artérielle résistante. La stimulation des barorécepteurs carotidiens est une approche innovante ciblant la régulation du baro-réflexe. La première génération de stimulateur des barorécepteurs (Rheos® ; CVRx, Inc., Minneapolis, MN, États-Unis) a démontré une bonne efficacité en termes de baisse de pression artérielle, cependant les risques opératoires liés à la complexité de la procédure étaient importants. La seconde génération de stimulateur des barorécepteurs (le système Barostim *neo*™ ; CVRx, Inc.) semble démontrer une efficacité similaire en termes de baisse de pression artérielle et un meilleur profil de sécurité en raison d'une procédure d'implantation plus simple. Nous présentons le premier cas français d'implantation d'un stimulateur des barorécepteurs avec le système Barostim *neo*™. Nous décrivons également les aspects physiopathologiques et le niveau de preuve actuel de la technique.

Background

Despite a wide number of antihypertensive treatments, roughly half of hypertensive subjects are not controlled [1]. The therapeutic strategy for managing resistant hypertension has been simplified recently in the latest French guidelines [2]. Resistant hypertension is defined as an uncontrolled blood pressure (BP) despite optimal doses of three antihypertensive treatments, including a diuretic. Resistant office BP must be confirmed using home BP measurement or 24-hour ambulatory BP monitoring (ABPM). When resistant hypertension is confirmed, patients undergo a work-up to rule out secondary hypertension. This may leave up to 10% of true resistant primary hypertension in dedicated centers accustomed to the management of hypertension in France [3—5]. These patients may be considered for a non-pharmacological approach (i.e. renal denervation). While this technique appeared very promising after the SYMPLICITY HTN-1 and HTN-2 trials, the publication of the SYMPLICITY HTN-3 trial has cast some doubt on its real efficacy [6—8]. In addition, there are some limitations related to renal function (estimated glomerular filtration rate < 45 mL/min) and renal artery anatomy (length and diameter before bifurcation, accessory renal arteries) that preclude its use in every resistant patient. Thus, there is still room for other approaches in this currently unsettled field.

One alternative (or additional) approach could be baroreceptor stimulation — a novel technique targeting the baroreflex via stimulation of the carotid sinus wall [9]. The recent European guidelines on hypertension made the following recommendations: to consider baroreceptor stimulation or renal denervation in case of ineffectiveness of drug treatment in patients with resistant hypertension (class IIb, level C) and, until more evidence is available on the long-term efficacy and safety of renal denervation and baroreceptor stimulation, to restrict these procedures to hypertension centers (class I, level C) [10].

We report here on the first French implantation of a baroreceptor stimulator for hypertension, and we discuss the pathophysiological features of and current levels of evidence for this technique.

Case report

A 74-year-old man was referred to our department for an arterial hypertension work-up. His medical history included