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Case Report

Baroreceptor Activation Therapy 2 Decades after Vascular Surgery on Both Carotid Arteries in a Patient with Resistant Hypertension: First Case Report in the Literature

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Patients with previous surgery of the carotids or significant stenosis are not included in the study populations of baroreceptor activation therapy (BAT). In this case report about a 78-year-old woman with implantation of a BAT system 2 decades after bilateral thromboendarterectomy, control of hypertensive dysregulation could be observed even 20 months after implantation. Successful modulation of the baroreceptors requires intact adventitial tissue near the carotid sinus. In our case with previous longitudinal incision and patch angioplasty, the nerval innervation had been preserved. After careful evaluation, patients with a history of carotid thromboendarterectomy might be considered for BAT.

Baroreceptor activation therapy (BAT) has been shown through randomized clinical trials and case series to be effective in treating resistant arterial hypertension.[1,2] It has however not been clear whether previous surgical interventions with resulting tissue scarring at the level of the carotid bifurcation would compromise the functionality and the safety of this procedure. We report here a case of BAT implantation in a patient who has had a conservative endarterectomy by longitudinal incision (C-CEA) years before.

CASE REPORT

In August 2015, a 78-year-old lady with recurrent chest pain, epigastric pain, and nausea presented to the emergency department. Initial systolic blood pressure (BP) was 240 mm Hg. Acute myocardial infarction and aortic dissection were excluded. Pheochromocytoma and Conn's syndrome were subsequently ruled out. Medical history included several percutaneous interventions of the coronary arteries in the last 20 years, angioplasties of the lower extremities and the abdominal aorta, and surgery of the carotids. Conservative endarterectomies by longitudinal incision with a Dacron patch angioplasty have been performed 27 years earlier on the right side and, twice, 27 and 17 years earlier on the left side. Blood tests showed a glomerular filtration rate (GFR) of 46 mL/min and a glycated hemoglobin A1c of 34.3 mmol/mol. The echocardiography showed signs of diastolic

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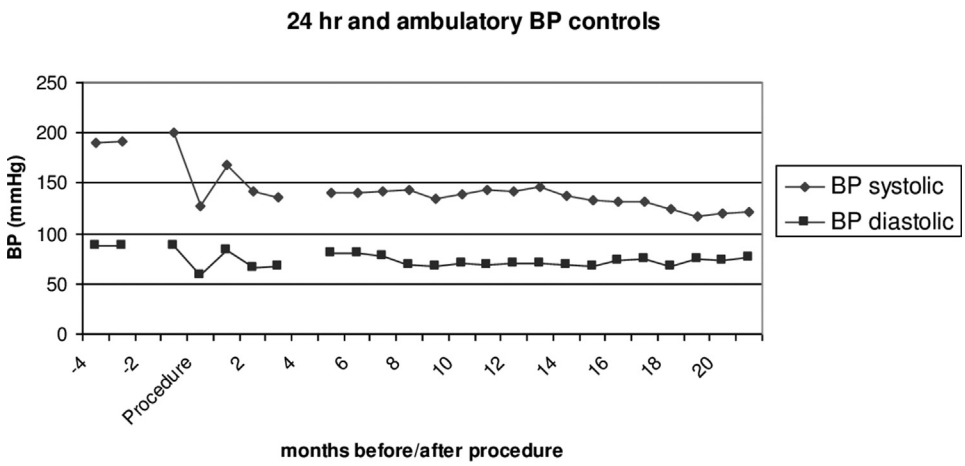

Fig. 1. Twenty-four—hr and ambulatory BP recordings before and after BAT implantation. In the months −4 to +3, 24-hr recordings were used. For the months 5 to 21, ambulatory daily recordings are documented.

dysfunction (E/e' 27, e' septal 4.0 cm/sec) with preserved systolic contractility, an enlarged left atrium, and mild mitral regurgitation. Hypertensive dysregulation was confirmed by a first 24-hr BP recording of 190/87 mm Hg (mean arterial systolic and diastolic pressure, Riva-Rocci method) (Fig. 1).

Therefore, she received additional intravenous urapidil. Owing to decreasing GFR values, angiotensin receptor blockers and spironolactone had to be discontinued at least temporarily (Fig. 2). Computed tomography angiography revealed significant bilateral renal artery stenosis. To rule out renovascular hypertension, percutaneous angioplasty of the left renal artery including implantation of a bare metal stent was performed successfully. A balloon angioplasty of the right renal artery followed 5 weeks later, though without stent deployment due to advanced calcification of the lesion. The patient was discharged from inpatient care only to be readmitted shortly afterward on 3 different occasions with hypertensive crisis and concomitant pulmonary edema. Similar clinical deteriorations were observed even under close invasive BP monitoring on the intensive care unit.

An experimental treatment attempt with BAT was discussed with the patient. In December, the patient gave written consent for the implantation of a BAT device. The duplex-sonographic workup of the carotid arteries showed a hemodynamically irrelevant restenosis of the origin of the right internal carotid artery with a visible small patch. The left side did not show any signs of stenosis; the patch appeared to be larger in size. The fact that the right side had been operated on only once and that the patch appeared to be smaller was crucial in determining the side to be chosen for lead placement.

A small incision of about 3 cm was made along the middle part of the old scar. Dissection was performed parallelly and next to the ventral margin of the sternocleidomastoid muscle. There was little scarring to notice. The small Dacron patch along the right internal carotid artery was seen. The vagal and the hypoglossal nerves were exposed. The carotid bifurcation was also exposed dorsally. The internal carotid artery was further exposed about 1 cm cranial to the Dacron patch (Fig. 3). Mapping under BP and heart rate monitoring was done with the help of the provided testing probe. A good response was detected dorsally just at the level of the bifurcation and the tip of the electrode (Neo CSL Md 1036, CVRx, Minneapolis, MN, USA) secured on the adventitia. The patient was discharged 12 days after surgery after uneventful recovery. Activation of the BAT system followed 20 days after surgery. The increase of modulation followed standard protocols of the manufacturer with the last adjustment taking place in July 2017 with an amplitude of 8.2 mA, a pulse width of 45 μs, and a frequency of 50 pps. The patient reported no relevant discomfort due to stimulation of the concomitant nervus vagus and hypoglossus.

The patient monitored her BP at home twice daily (Fig. 1). One episode of complicated hypertensive dysregulation was observed 7 months after surgery. The last ambulatory blood test showed a GFR of 42 mL/min.

DISCUSSION

The activation of the baroreceptor by electrical stimulation is a device therapy for patients with resistant hypertension and is included in the guidelines of the European Society of Hypertension.[3] Significant reduction of BP with BAT was observed in case series and randomized trials including patients with observation times up to 6 years.[1,2] Current contraindications include previous surgical procedures near the carotid arteries. A case of C-CEA with BAT implantation as a one-stage procedure and excellent results after 18 months was published.[4]