

# Paroxysmal Hypertensive Episodes Caused by Direct Massage of the Carotid Artery by a Doppler Ultrasound of the Neck in a Laryngectomee

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## Abstract

Paroxysmal hypertension (PH) can be associated with the carotid artery baroreceptors' failure due to past exposure to radiation treatment. This report presents a patient who experienced repeated PH episodes due to the direct massage of the carotid artery during Doppler ultrasound of the neck. The radiation damage to the carotid artery baroreceptors might have increased their hypersensitivity to the mechanical and ultrasonic stimulation during the diagnostic test, leading to the hypertensive episodes. Patients who had received radiation therapy for head-and-neck cancer and require Doppler ultrasound of the carotid artery should be monitored for PH by recording their blood pressure prior and after the test.

**Keywords:** Carotid artery, laryngectomee, paroxysmal hypertension, radiation, ultrasound

## INTRODUCTION

Paroxysmal hypertension (PH, also called pseudopheochromocytoma) is characterized by sudden, severe, symptomatic, and transient elevations in blood pressure (BP) occurring in patients, in whom a pheochromocytoma has been excluded.<sup>[1]</sup> These episodes can last from 10 to 20 min to several hours, and their frequency can range from several times a day to once every several months. The patients' BP is generally normal or low between the episodes; however, it can be elevated in those with underlying hypertension.

Baroreflex failure is one of the causes of PH and is characterized by significant and frequent fluctuations in BP.<sup>[1]</sup> It is caused by the reduced performance of the baroreflexes that usually buffer BP instability. This condition often results from damage to the carotid baroreceptors by neck irradiation or surgery. The inducers and causes of PH episodes are unknown.

This report describes a patient who experienced repeated paroxysmal hypertensive episodes following direct massage of the carotid artery during the Doppler ultrasound of the neck.

## CASE REPORT

A 77-year-old male who underwent laryngectomy 11 years earlier (2006) presented to the vascular laboratory in March 2019 for routine Doppler ultrasound examination of his carotid arteries. The patient had carotid arteries ultrasound performed every 2 years since 2009. No carotid arteries stenosis was found in these tests, and the patient did not experience any discomfort afterward.

The patient was diagnosed with hypopharyngeal squamous cell carcinoma (T1, N0, and M0) that was treated with 70 Gy intensity-modulated radiotherapy 13 years earlier (2006). Cancer recurrence (T2, L0, and M0) 2 years later (2008) required total laryngectomy (2009). Restoration of his larynx was performed using a forearm free flap. He had no signs of tumor recurrence since then. He was speaking using the esophageal–tracheal voice prosthesis.

He suffered from diverticulitis and migraines. The patient did not smoke or consume alcohol. The patient developed

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PH 4 years after receiving the radiation therapy (2000). These episodes were characterized by the sudden appearance of high BP. His BP would rise from a baseline of 135/75 (pulse 80/min) to 170/100–250/115 (pulse 95–115). Most of these episodes were unprovoked, and some occurred after strained speech or migraine headaches. The episodes occurred every 2–7 days and would last for several hours unless treated with clonidine 0.1 mg. The patient experienced dizziness, headache, and migraines during some of these episodes. Other causes for these episodes (i.e., pheochromocytoma, renal artery stenosis, and hyperthyroidism) were excluded. He did not suffer from any other cardiovascular problems. He received maintenance treatment with beta-blocker (atenolol: 12.5 mg/qd) and alpha-blocker (doxazosin: 0.5 mg/qd) and lisinopril (10 mg/d).

Following initiation of the maintenance treatment, the frequency of paroxysmal hypertensive episodes subsided to 2–3/year. He was also treated with biofeedback therapy and counseling.

Physical and neurological examination performed a week prior to the ultrasound test was within normal limits. He was well hydrated, BP was 141/80, pulse was 62/min, respiration was 16/min, and SpO<sub>2</sub> was 98%. The ultrasound study illustrated a 50%–69% stenosis of the left proximal carotid artery and no stenosis >50% of the right internal carotid artery.

Ten minutes after completion of the ultrasound, the patient BP was 210/110 (pulse: 84/min). He experienced light headiness, frontal headache, and nausea. His BP rose to 245/115 (pulse 92/min) 10 min later and 250/115 (pulse: 94/min) 20 min later. Twenty minutes after taking clonidine 0.1 mg, his BP declined to 170/95 (pulse: 74/min), and 60 min later, it was 140/80 (pulse: 60/min).

During the 3 months following the above episode of hypertension, the patient's BP was stable at 135–145/75–90. He did not experience any hypertensive episode during that time period. He returned to the vascular laboratory 3 months later for follow-up carotid artery ultrasound. He experienced a similar hypertensive episode where his BP reached 250/105 (pulse 84/min) that subsided only after he took a tablet of clonidine 0.1 mg. He continued to receive maintenance treatment with atenolol (12.5 mg/qd), doxazosin (0.5 mg/qd), and lisinopril (10 mg/d). The patient had been followed for the following year and had experience three unprovoked paroxysmal hypertensive episodes.

## DISCUSSION

This is the first report of repeated PH episodes due to direct massage of the carotid artery during a Doppler ultrasound of the neck, in a patient who had received radiation therapy for head-and-neck cancer. The PH episodes did not occur after ultrasound before and emerged only after the patient developed stenosis of the left proximal carotid artery. The previous radiation damage caused to the carotid artery baroreceptors might have increased over time and eventually lead to their hypersensitivity to the mechanical and ultrasonic stimulation during the diagnostic test, leading to the hypertensive episodes.

Mechanical stimulation of undamaged carotid results in bradycardia and a drop in BP.<sup>[2]</sup> However, our patient had the opposite response – significant elevation of his BP and tachycardia. This unexpected response may be the result of the damage inflicted to the baroreceptors by the radiation therapy.

Acute episodes of PH can be self-treated, or be managed at a medical office, or emergency department depending on the severity of the episode and the patient's comorbidities. Either clonidine or alprazolam alone or in combination is used in self or medical office treatment. These agents generally lower the BP within an hour. Treatment at the emergency department is usually with an intravenous alpha- and beta-blocking antihypertensive agent (e.g., labetalol) plus an anxiety-reducing agent (e.g., alprazolam).

The chronic management of PH depends on the frequency and severity of paroxysms and if the patient's life is influenced. Treatment of those who experience rare or mild paroxysms is generally limited to the acute management of the paroxysms. Those with recurrent episodes causing severe BP elevation or symptoms or with repeated paroxysms that impair their life are often treated with an antidepressant. Psychotherapy has also been advocated to prevent these episodes.<sup>[3,4]</sup>

Although the combination of alpha- and beta-blockers is often utilized as chronic preventive or mitigating treatment for PH, there are no adequate clinical studies to support it. Unfortunately, there is no cure for PH.

Since the patient would require further evaluation of his carotid artery stenosis, it is planned to use less pressure on the neck when performing the ultrasound, and administer him clonidine 0.1 mg tablet 30 min prior to his upcoming ultrasonic examination. Alternatively, the carotid arteries could be studied by other diagnostic modalities such as cerebral angiography, magnetic resonance angiography, or computed tomographic angiography.

## CONCLUSIONS

Paroxysmal hypertensive episodes may be caused by direct massage of the carotid artery during Doppler ultrasound of the neck in patients who had received radiation therapy for head-and-neck cancer. Patients who had received radiation therapy for head-and-neck cancer and require Doppler ultrasound of the carotid artery should be monitored for PH by recording their BP prior and after the test.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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