

Carotid sinus malfunction presenting with presyncopal episodes during radiation therapy for head and neck cancer

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Lesson

We report the case of a 67-year-old Caucasian man with unexplained presyncopal episodes during radiation therapy for oropharyngeal cancer.

Keywords

baroreflex failure, carotid sinus syndrome, head and neck, radiation therapy

from mild stomatitis Grade 2 and skin erythema, the patient did not suffer from any other acute radiation toxicity. He had sufficient fluid and food intake without any signs of dehydration. The patient demonstrated two to three episodes per day lasting approximately 20–30 min with almost the same symptoms and signs like onset systolic BP below 70 mmHg and bradycardia.

Introduction

Radiotherapy plays an important role in the management of patients with head and neck tumours. Despite advances in treatment planning software systems and treatment delivery like intensity-modulated radiation therapy and image-guided radiation therapy, toxicity of treatment is still an issue.

Two very rare complications of radiotherapy can be baroreflex failure and carotid sinus syndrome due to dysfunction of the carotid sinus. We present the case of a 67-year-old man with unexplained presyncopal episodes during treatment for oropharyngeal cancer.

Case presentation

A 67-year-old Caucasian man with oropharyngeal cancer (T2N0M0) presented during the fourth week of treatment with unexplained presyncopal episodes, with systolic blood pressure (BP) below 70 mmHg, bradycardia (pulse rate less than 50 beats per minute) and dizziness. The patient was treated in cobalt-60 radiotherapy unit, with classic fractionation scheme (daily 2 Gy fractions, 5 days a week to a total scheduled dose of 70 Gy).

The initial treatment field included primary lesion plus bilateral lymph nodal areas (Figure 1). Apart

Figure 1. Simulation film of the patient demonstrates lateral (right) field of treatment (first phase). Black circle indicates where carotid sinus (bifurcation of the common carotid artery) is approximately located.



Clinical cardiological examination, electrocardiogram (ECG) and laboratory tests (complete blood count and biochemistry) failed to reveal the cause. The patient had no cardiovascular medical history, all ECG tests performed during the episodes apart from bradycardia were normal and imaging studies like ultrasonography (U/S) of the carotid arteries and computed tomography failed again to reveal a cause. In the intervals of the episodes, our patient had normal BP and normal heart rate. The patient was

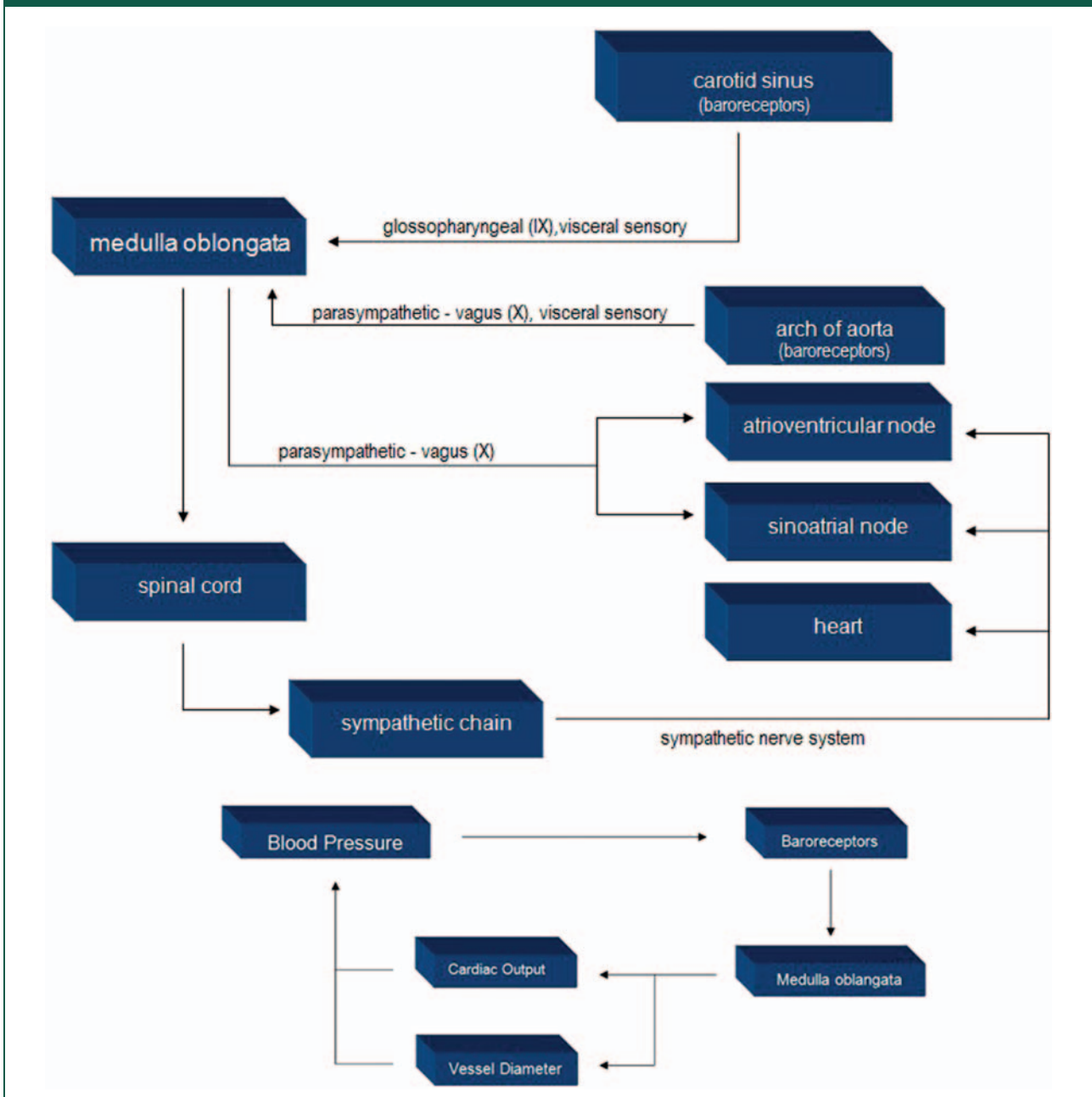
managed with corticosteroids and intravenous fluids with excellent response.

The patient had free medical history, and there was no history of surgery to the neck region.

Discussion

Surgery but most importantly radiotherapy to the neck may lead to injury to the carotid arteries particularly atherosclerosis, thrombosis and fibrosis.

Figure 2. Blood pressure control (down) and baroreceptor reflex (up).



Patients who survive more than five years after irradiation for head and neck tumours may demonstrate stroke and clinically significant carotid stenosis.^{1–3}

The baroreceptors produce inverse changes in the two divisions of the autonomic nerve system. In response to a fall in BP, the sympathetic division is activated while parasympathetic activity is reduced. Conversely, in response to a rise in BP, sympathetic nerve activity is decreased while the parasympathetic division is stimulated⁴ (Figure 2).

In general, the clinical manifestation of the carotid sinus syndrome is typically of recurrent presyncopal or syncope episodes. Treatment is symptomatic and in selective cases cardiac pacing is recommended. It is interesting that in the past, radiotherapy was administered for the treatment of carotid sinus syndrome.⁵

There have been very few reports in the literature describing these two conditions related to radiotherapy. In a study by Sharabi *et al.*, three patients with labile BP and chronic orthostatic intolerance developed years after neck irradiation were evaluated with autonomous nervous system function tests. The authors concluded that in all three patients, baroreflex failure was a late sequela of neck irradiation and proposed that it resulted from encasement of baroreceptors in stiffened carotid sinus walls, according to the findings of the U/S (carotid intimal thickening and atherosclerosis).⁶

Timmers *et al.* evaluated 12 patients 1.0–4.4 years after completion of radiotherapy. The investigators measured among others baroreflex sensitivity, BP level and variability. Although the tests revealed that baroreflex sensitivity was lower in patients than in controls and BP was significantly higher, the authors did not find any clinically relevant BP lability. The possible mechanisms responsible, according to the authors, could have been (1) lower cranial nerve neuropathy – palsies; (2) encasement of small afferent nerves fibers by connective tissue fibrosis and (3) structural changes of the internal carotid artery wall. They concluded that the decreased baroreflex sensitivity observed after radiotherapy does not have functional implications for the control of arterial BP.^{7,8}

Few other reports in the literature describe these two conditions, while most of them describe baroreflex failure as the possible cause of labile hypertension and tachycardia. Nearly all patients present with symptoms years after treatment, indicating that changes to carotid sinuses take months to years to lead to baroreceptor malfunction. Interestingly, in our case, the patient presented with severe

hypotension and bradycardia during therapy. Cardiology examination revealed severe vagotonia, but laboratory tests including ultrasound were normal (absence of thickened intima or atheromatous plaques into the carotid lumen). No explanation can be given for the early manifestation of symptoms in our patient which may be attributed to Carotid Sinus Hypersensitivity (CSH) often seen in elderly patients. According to relevant literature, the prevalence of CSH in elderly patients presenting with falls is about 25%. Its incidence rises with age, and it is much more common in men, over the age of 80.^{8–10}

Conclusion

Radiotherapy for head and neck cancer increases long-term survival but rarely may be the cause of baroreceptor malfunction leading to baroreflex failure and carotid sinus syndrome. Physicians should be aware of baroreflex failure and carotid sinus syndrome as late radiation-induced toxicity of head and neck irradiation.

Declarations

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Guarantor: GJ

Contributorship: GJ performed data collection, analysis and also the drafting of the manuscript. GJ, PC and KV performed the literature searching and the follow-up of the patient. KV, KJ and KN undertook the final editing of the manuscript.

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