CASE REPORT

Syncope from radiation-induced baroreceptor failure

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SUMMARY

Orthostatic hypotension has a vast differential that has been previously described throughout the literature. However, baroreceptor failure as a sequela of head and neck radiation is not often recognised as an important cause of dramatic haemodynamic variability. As a result, individuals suffering from baroreceptor failure likely have been undertreated. Herein, we report a case of a patient with a history of radiation to the neck for squamous cell carcinoma of the tongue and resultant baroreceptor failure resulting in syncope.

BACKGROUND

Baroreceptors are the fastest mechanism to regulate haemodynamic changes (blood pressure, heart rate, contractility and peripheral resistance)^{1–4} The baroreceptors are mechanoreceptors located through the aortic arch and the carotid sinus. By sensing pressure and tension changes in the arterial wall, impulses are directly sent to the vasomotor centre of the brain via the nucleus of tractus solitaries.⁴ When functioning properly, decrease in blood pressure when standing is sensed by the baroreceptors, which will result in increased firing of impulses to the vasomotor centre. Subsequently, the vasomotor centre will uninhibit sympathetic activity, which decreases vagal tone increasing the heart rate and sympathetic activity in the blood vessels.⁴ Baroreceptor failure following radiotherapy is an under-recognised cause of labile blood pressures with orthostatic changes and recurrent syncope. Diagnosis can be challenging since the majority of signs and symptoms overlap with numerous other aetiologies.² Therefore, it is often a diagnosis of exclusion. Physicians must have a high clinical suspicion and be cognizant of the long-term effects of patients receiving radiation therapy.

CASE PRESENTATION

A 72-year-old male with medical history of squamous cell carcinoma of the right lateral base of tongue, hypothyroidism, hypertension, hyperlipidaemia presented with multiple episodes of lightheadedness and sensation of ‘passing out’. These episodes occurred multiple times a week, lasting 30–45 min; however, they began to increase in frequency and severity over the past month. He had received radiation therapy 4 years prior to his presentation and his cancer was in remission. On admission, his blood pressure was 170/84. His neurological examination

was unremarkable. Laboratory analysis and MRI/MR angiography of the head and neck were unremarkable. Telemetry revealed no arrhythmias. He underwent tilt table testing (table 1) which provoked his presenting symptoms of lightheadedness, tongue deviation, hypotension and presyncope. Therefore, the symptoms were believed to be secondary to neurocardiogenic syncope. He was discharged home with instructions to increase salt intake, applications of thromboembolic deterrent (TED) stockings, discontinuation of his beta blocker and a Holter monitor. He returned 2 days later after another significant episode of hypotension and presyncope. His systolic blood pressure was found to be in the 170s again. His Holter monitor demonstrated a significant pause of 6.8 s despite discontinuation of beta blocker. He underwent a permanent pacemaker implantation. He was discharged home but again returned 4 days later with another similar episode. Once more, he was hypertensive to the 170 systolic, and the pacemaker was interrogated without significant arrhythmia and normal device function. Physical examination disclosed no neurological deficits and repeat CT angiogram of the head and neck again demonstrated no significant vascular disease. At this point, diagnosis of baroreceptor failure was made.

OUTCOME AND FOLLOW-UP

He was discharged home with fludrocortisone and midodrine which completely alleviated his symptoms. He continues to follow-up with his cardiologist to monitor for return of symptoms.

DISCUSSION

Our patient showed a unique presentation of volatile haemodynamic variability and syncope. While initially diagnosed with neurocardiogenic syncope, he would later go on to demonstrate significant bradycardia with pauses and extreme variations of hypertension and hypotension. Despite placing a permanent pacemaker, he continued to have symptomatic episodes. Baroreceptor failure is an under-recognised cause of labile blood pressure and recurrent syncope.² The diagnosis is very challenging and is often a diagnosis of exclusion of other aetiologies such as medications, metabolic aetiologies, thrombotic events and neurocardiogenic syncope.⁵ Baroreceptor failure is characterised by labile blood pressures and the inability of stress to increase the heart rate.⁶ Radiation therapies and neck surgeries are known causes of baroreceptor

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Table 1 Results of tilt table testing

Tilt table testing					
Time	HR	BP	RR	O2	Symptoms
Baseline	66	171/79	12	97	None
5 min	69	151/83	12	95	None
10 min	73	162/85	14	95	None
15 min	76	135/71	14	94	None
20 min	60	95/46	18	94	See below*

*Severe symptoms of nausea, dizziness, presyncope occurred along with noted facial droop and slurring of speech. The patient was immediately returned to zero degrees and the test was terminated. His facial droop and slurred speech resolved and had normal neurological examination.

BP, blood pressure; HR, heart rate; O2, per cent saturation; RR, respiratory rate.

Learning points

- ▶ Baroreceptor failure following radiotherapy is an under-recognised cause of labile blood pressures with orthostatic changes and recurrent syncope.
- ▶ Diagnosis can be challenging since the majority of signs and symptoms overlap with numerous other aetiologies.
- ▶ Baroreceptor failure is a diagnosis of exclusion.
- ▶ Physicians must have a high clinical suspicion and be cognizant of the long-term effects of patients receiving radiation therapy.

damage.^{3 7} The two key points to differentiate between neurocardiogenic syncope in this patient were the presence of labile blood pressure with extreme hypertension and the history of radiation therapy to the neck. Once the diagnosis

of baroreflex failure established, treatment can prove difficult with the rapid fluctuations in blood pressure as seen in our patient. Fludrocortisone, midodrine, clonidine and TED stockings are considered the treatment of choice.^{2 6} Permissive hypertension allowed him to avoid dramatic symptomatic hypotensive episodes.

Contributors All authors contributed equally to this paper. All had substantial contributions to the conception or design of the work, or the acquisition, analysis or interpretation of data, drafting the work or revising it critically for important intellectual content, final approval of the version published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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