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CASE REPORT

Carotid sinus hypersensitivity as a cause of multiple falls in an elderly patient: a case report

Hipersensibilidade do seio carotídeo como causa de múltiplas quedas em paciente idoso: relato de caso

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ABSTRACT

The carotid sinus is a neurovascular structure composed of baroreceptors responsible for detecting changes in blood pressure. When the baroreflex response of the carotid sinus becomes excessively sensitive, it can result in symptoms such as syncope, dizziness, and hypotension, leading to falls. The carotid sinus hypersensitivity, which has a sparsely documented incidence, is more common in males over 75 years old. It can present a cardioinhibitory response, with asystole lasting more than 3 seconds, or a vasodepressor response, with a drop of more than 50 mmHg in systolic blood pressure. The Tilt-test is considered the best diagnostic test, and the treatment of choice is a pacemaker implantation, representing a treatable cause of falls. Given the importance of the topic, the objective was to report, through a literature review and a patient record review, the case of a 72-year-old male patient with a history of frequent fainting episodes over several months and a series of inconclusive cardiological and neuroimaging exams. Throughout the investigation, he was prescribed carbamazepine and fludrocortisone, yet the fainting episodes persisted. Subsequently, he underwent a Tilt-test, which showed physiological behavior of the blood pressure and heart rate. However, during carotid sinus massage with the table tilted at 60°, he reported dizziness and paresthesia in his left upper limb, along with a drastic drop in blood pressure for 5 seconds. Following the implantation of a dual-chamber pacemaker and the discontinuation of carbamazepine and fludrocortisone, no further fainting episodes occurred during the 10-month follow-up period, thereby confirming the diagnosis of carotid sinus hypersensitivity with a cardioinhibitory response.

Keywords: Falls; Syncope; Carotid sinus hypersensitivity; Tilt test; Elderly.

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RESUMO

O seio carotídeo é constituído de uma estrutura neurovascular composta por barroreceptores, responsáveis por detectar alterações da pressão arterial. Quando a resposta do barroreflexo do seio carotídeo fica excessivamente sensível pode resultar em sintomas como síncope, tontura e hipotensão, tendo como consequência, quedas. A hipersensibilidade do seio carotídeo, cuja incidência apresenta dados escassos, é mais comum no sexo masculino, acima de 75 anos. Pode apresentar resposta cardioinibitória, com assistolia superior a 3 segundos ou vasodepressora, com queda superior a 50 mmHg na pressão arterial sistólica. O *Tilt test* é considerado o melhor teste diagnóstico e o tratamento de escolha consiste no implante de marcapasso, representando uma causa importante de quedas tratável. Mediante a importância do tema, objetivou-se relatar por meio de revisão de literatura e verificação de prontuário, o caso de um paciente de 73 anos com diagnóstico de hipersensibilidade do seio carotídeo, cujo quadro clínico iniciou-se com múltiplas quedas, precedidas por lipotimia/síncope, ou seja, sintomas prodrômicos de hipotensão. Para concretizar o diagnóstico, foram realizados exames complementares e o *Tilt test*, o qual demonstrou comportamento fisiológico da pressão arterial e frequência cardíaca. À compressão do seio carotídeo esquerdo, o paciente cursou com tontura e parestesia no membro inferior esquerdo, comprovando o diagnóstico de hipersensibilidade do seio carotídeo deste lado. O paciente foi posteriormente submetido a implante de marcapasso de dupla câmara e acompanhado por quatro meses. Não ocorreram outros episódios sincopais.

Palavras-chave: Quedas; Síncope; Hipersensibilidade do seio carotídeo; *Tilt test*; Idosos.

Introduction

The anatomy of the conventional human carotid arterial system is traditionally described as the common carotid artery (CCA) ascending in the neck and bifurcating at the upper border of the thyroid cartilage into the internal carotid artery (ICA) and the external carotid artery (ECA)[1]. The carotid sinus (CS) is a neurovascular dilation seen between the CCA and the origin of the proximal ICA, this being the most common location of the CS. Anatomical variation in the height and site of the ICA bifurcation and the exact position of the CS within the carotid arteries has significant consequences for the safety and effectiveness of clinical interventions carried out in this area[2].

Moreover, the CS is comprised of baroreceptors innervated by a branch of the glossopharyngeal nerve (IX) that detect changes in blood pressure and convey stimuli to the solitary tract located in the bulbar region of the brainstem[3].

Carotid sinus hypersensitivity (CSH) is understood as an exaggeration of a physiological reflex and can result in disabling dizziness (presyncope), syncope, and hypotension — the symptoms most frequently attributed to the condition. Case reports in the literature describe typical provocative maneuvers such as turning the head, shaving, or wearing tight collars around the neck. Initial symptoms tend to appear suddenly, last briefly, and resolve quickly; however, in some situations, they may persist longer, leading to significant hypotension[4].

This pathology shows a marked male predominance (4:1), especially in individuals over 70 years of age, with a progressive increase in prevalence with advancing age, reaching approximately 40% in the ninth decade of life. Nevertheless, the reported frequency of CSH in the literature is highly variable because of the different methods employed, divergences in defining what constitutes a hypersensitive response, and the characteristics of the populations studied[5,6].

Carotid sinus hypersensitivity (CSH) accounts for at least 10% of syncope episodes because stimulation of the carotid sinus directly influences vagal tone. Syncope is therefore the most common symptom, occurring abruptly and often accompanied by falls and physical trauma. These falls are a leading cause of loss of autonomy in older adults, potentially resulting in fractures and triggering feelings of fear and insecurity that compromise mobility and limit daily activities. In addition, the condition correlates with atherosclerotic disease, previous surgery, and a history of cervical irradiation. It is thus essential to distinguish it from other common causes of falls and syncope of indeterminate origin in the elderly to enable appropriate treatment and improve quality of life[7,8].

The most appropriate test for diagnosing vasovagal syndrome, which underlies neurocardiogenic syncope, is theTilt test, illustrated in Figure 1. This test significantly helps clarify cases whose etiology is initially obscure. During the examination, the patient undergoes controlled postural changes designed to induce variations in blood pressure and heart rate. The test is considered positive when these changes lead to presyncope or syncope, with or without associated bradycardia and/or hypotension[9].

For diagnosing CSH, however, a more specific test is required: compression of the carotid sinus for 5–10 seconds. CSH is defined by a cardiac pause (sinus or atrioventricular block) of ≥3 seconds and/or a drop in systolic blood pressure of ≥50mmHg in asymptomatic patients, or >30mmHg in symptomatic individuals, during the diagnostic maneuver[10,11].

Therapeutic approaches for CSH aim primarily at preventing symptoms. The condition may, however, indicate the need for cardiac pacemaker implantation when the etiology is predominantly cardioinhibitory. Another therapeutic modality is surgical intervention consisting of removing the adventitia of the internal carotid artery (ICA) to interrupt the afferent neural pathway and thereby reduce baroreflex sensitivity[12-14].

The present study aims to report the case of an elderly patient with CSH — a treatable condition that can be related to episodes of falls — and to highlight the role of the Tilt test in diagnostic investigation. It also emphasizes the importance of including carotid sinus massage performed in the upright position as part of the investigative protocol in patients with episodes of syncope.

Case Report

C.E., male, native of Matão, began in 2022 — at 72 years of age — to experience frequent falls preceded by presyncope/syncope, with prodromal hypotensive symptoms and nausea after regaining consciousness. The patient had a history of hypothyroidism treated with levothyroxine and mild amnestic cognitive impairment managed with donepezil (an acetylcholinesterase inhibitor). He was also taking dihydroergocristine, prescribed under the initial suspicion of peripheral labyrinthopathy as the possible etiology of his falls. In addition, he had a history of gastric ulcer, surgically treated by gastrectomy more than ten years earlier.

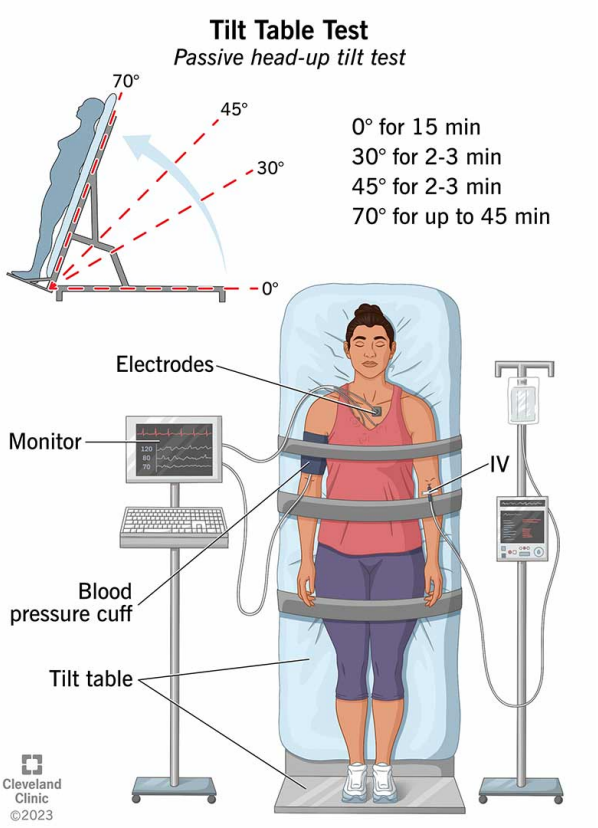

Figure 1. Schematic representation of the Tilt test. In the center of the image, there is a patient lying on a table with an angular range of 0°, 30°, 45°, and 70°, remaining at these angles for periods of 15 minutes, 2-3 minutes, 2-3 minutes, and 45 minutes, respectively. To the left of the patient are devices used to monitor vital signs throughout the procedure.

Source: Tilt Table Test. Cleveland Clinic, Cleveland, 2023. Available from: https://my.clevelandclinic.org/health/diagnostics/17043-tilt-table-test).

For diagnostic work-up, the patient underwent the following examinations: carotid Doppler ultrasound (minimal carotid atheromatosis without hemodynamic repercussion); brain magnetic resonance imaging (findings consistent with cerebral aging and areas of white-matter change possibly related to microangiopathy or early gliosis) that did not explain the symptoms; 24-hour Holter monitoring, which showed sinus rhythm, a mean heart rate of 58 beats per minute, rare ventricular extrasystoles, and no repolarization changes suggestive of ischemia; and two-dimensional color Doppler echocardiography (preserved global left-ventricular function and normal chamber dimensions, with mild mitral and tricuspid insufficiency). Finally, ambulatory blood pressure monitoring (ABPM) revealed a normal blood-pressure profile over 24 hours. Despite these examinations, none clarified the cause of the patient's symptoms.

Concomitantly, a laboratory work-up was performed, with results within normal limits, as shown in Table 1.

In May 2023, the patient underwent a Tilt test as part of the diagnostic investigation, with electrocardiographic monitoring and intermittent blood-pressure (BP) measurements. He was first placed in the horizontal supine position to record baseline parameters, showing a mean BP of 122/70 mmHg and an average heart rate of 63 beats per minute, with no symptoms or hemodynamic changes. The table was then tilted to 60°, during which his BP was approximately 110/68 mmHg and the average heart rate 68 beats per minute. Compression of the left carotid sinus elicited dizziness and paresthesia in the left lower limb, accompanied by a marked BP drop lasting five seconds. This finding confirmed the diagnosis of left carotid sinus hypersensitivity.

The patient subsequently underwent dual-chamber pacemaker implantation and was followed for ten months without further syncopal episodes.

The study was approved by the Research Ethics Committee of the University of Araraquara – UNIARA (CAAE 78135224.4.0000.5383), and written informed consent was obtained from the patient.

Discussion

The progressive increase in life expectancy in the Brazilian population has prompted important discussions about disabling events that can affect older adults' lives, notably falls. The main risk factors for falls in older adults include age over 80 years, female sex, impaired neuromuscular function, the presence of chronic diseases, previous fall history, psychocognitive deficits, polypharmacy, use of benzodiazepines or other potentially inappropriate medications according to the Beers criteria, functional disability, and postural hypotension[15,16].

Syncope is defined as a transient loss of consciousness, whereas presyncope is a near-syncope state. Both conditions predispose individuals to falls. According to Fillit (2010)[17], hypertensive older adults, those with heart disease, users of antihypertensive drugs such as vasodilators and diuretics, anemic or dehydrated individuals, and those with dysautonomic disorders exhibit altered circulatory adjustments to postural changes, making them susceptible to postural hypotension, presyncope, or syncope.

Postprandial syncope is the most common cause in older adults, since after meals blood flow to the gastrointestinal tract rises. This redistribution can lower cerebral perfusion and culminate in syncopal episodes. Symptoms usually begin within two hours after eating and are more prevalent among institutionalized elders, who have a greater propensity toward a sedentary lifestyle, prolonged immobility, and exposure to more stressful environments. These factors contribute to cardiovascular deconditioning and impair the autonomic response to postural changes. Older adults thus become more susceptible to a reduction in blood volume which, together with age-related changes in diastolic function, can produce low cardiac output, increasing the propensity to orthostatic hypotension and vasovagal syncope[18-20].

Neurological causes of syncope include autonomic dysfunction — which may be primary, secondary, or drug-induced — as well as cerebrovascular disease and subclavian steal syndrome. The chief clinical manifestation linked to these neurological conditions is orthostatic hypotension; however, when focal neurological deficits are present, as in stroke, the presentation can include episodes of syncope[21].

Among neurally mediated causes, vasovagal syncope accounts for about one-third of sudden-loss-of-consciousness cases and is commonly associated with the use of diuretics and vasodilators, especially in young patients. In older adults, however, aortic stenosis is the structural heart disease most frequently related to syncopal episodes triggered by physical exertion or exposure to hot baths[22].

Carotid sinus hypersensitivity also deserves mention, being responsible for up to 20% of syncope cases in individuals over 65 years. Although not the most frequent cause, its recognition is essential because it is a potentially treatable etiology[23].

It is worth noting, in this case, the use of an acetylcholinesterase inhibitor — a drug potentially associated with postural hypotension and atrioventricular block[24]. However, Holter monitoring and ambulatory blood pressure monitoring (ABPM) revealed no malignant bradyarrhythmias or significant hypotensive episodes, ruling out this etiologic hypothesis. In addition, dihydroergocristine was discontinued, as peripheral labyrinthopathy was

Table 1. Laboratory tests, march 2022.

Hb 13.0 g/dL/ Hct 41%	CR 1.0 mg/dL
WBC 6,200/mm³ (no left shift)	AST 27 U/L
Platelets 315,000/mm³	ALT 26 U/L
Fasting glucose 77 mg/dL	TSH 2,62 µIU/mL (ref. 0.48 – 5.6)
Total cholesterol 235 mg/dL	25-OH Vitamin D 23 ng/mL
HDL-C 64 mg/dL	Vitamin B12 345 pg/ml (ref. 172-890)
Triglycerides 137 mg/dL	Albumin 4.4 g/dL
Urea 38 mg/dL	Na 135 mEq/L

Source: Elaborated by authors, 2025.

considered an unlikely cause of syncope, especially because the frequency of falls remained unchanged both during its use and after the medication was stopped.

Conclusion

Based on the clinical data and the literature reviewed, the recurrent syncopal episodes with falls experienced by patient C.E. were confirmed to be associated with carotid sinus hypersensitivity (CSH), a condition of significant prevalence in older adults, particularly males. The diagnosis was established via a Tilt test with carotid sinus compression, during which the patient experienced presyncope on left-sided stimulation. Given the diagnosis of cardioinhibitory CSH, C.E. underwent pacemaker implantation — the preferred therapeutic approach in such cases — and progressed satisfactorily without further falls. This underscores the importance of performing a Tilt test with carotid sinus massage in the upright position as a fundamental component of the diagnostic work-up in patients with episodes of syncope.

Author's contributions

We describe contributions to the papers using the taxanomy (CRediT) provided above: *Conceptualization, Investigation, Methodology, Visualization & Writing – review & editing*: Author TFS; Author ASS; Author MFL; Author LT; Author IAM; Author PLM; Author PRR. *Project administration, Supervision & Writing – original draft*: Author TFS; Author ASS; Author MFL; Author MCFBA. *Validation & Software*: Author TFS. *Resources & Funding acquisition*: is not necessary. *Data curation & Formal Analysis*: Author TFS; Author; MCFBA; Author ASS.

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