Radiology Case Reports 20 (2025) 42–46

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/radcr

Case Report

Unmasking the hidden culprit: Recurrent syncope in a 62-year-old man linked to severe internal carotid artery stenosis ☆

Ibrahim Khalil, MBBS[a,*], *Md. Imran Hossain, MBBS*[b]

[a] *Dhaka Medical College and Hospital, Dhaka, Bangladesh*
[b] *Faculty of Medicine, University of Dhaka, Dhaka, Bangladesh*

ARTICLE INFO

Article history:
Received 23 August 2024
Revised 16 September 2024
Accepted 17 September 2024

Keywords:
Recurrent syncope
Internal carotid artery stenosis
Carotid endarterectomy
Cerebrovascular disease
Vascular risk factors
Magnetic resonance angiography
Digital subtraction angiography

ABSTRACT

Syncope, a brief loss of consciousness, has many potential causes, with internal carotid artery (ICA) stenosis being a relatively uncommon but serious one. We present the case of a 62-year-old man from Dhaka, Bangladesh, who experienced recurrent syncope over 6 months, characterized by a brief loss of consciousness, occasional dizziness, and blurred vision. Despite a history of hypertension and hyperlipidemia, initial cardiac and neurogenic investigations were inconclusive. Magnetic resonance angiography revealed 90% stenosis of the right ICA, which was confirmed by digital subtraction angiography. The patient was treated with antiplatelet therapy, statins, and antihypertensives, and underwent carotid artery stenting. His postoperative recovery was uneventful, and he remained symptom-free during follow-up. This case underscores the importance of considering ICA stenosis in patients with recurrent syncope and comorbid vascular disease, particularly in resource-limited settings where timely diagnosis and intervention can prevent serious cerebrovascular complications.

Introduction

Syncope is defined as the self-resolving, sudden loss of consciousness, and is a complex clinical condition. It is usually caused by a temporary decrease in cerebral blood flow, which can be caused by many factors. Although cardiac and neurogenic causes are the most common causes, other causes such as internal carotid artery (ICA) stenosis are rarely considered [1]. ICA stenosis can cause cerebral hypoperfusion and, in rare cases, recurrent syncope, especially in individuals with multiple vascular risk factors like diabetes mellitus and atherosclerosis [2]. Syncope is not so uncommon and usually occurs at similar rates in men and women. Most people experience 1 syncopal episode once in their lifetime. The lifetime prevalence of syncope is 35%. The occurrence of the first syncope

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

* Corresponding author.
E-mail address: ibrahim124904@gmail.com (I. Khalil).

https://doi.org/10.1016/j.radcr.2024.09.091

reaches its peak between the ages of 10 and 35. The incidence substantially increases with advanced age, especially after the age of 70, and shows a bimodal distribution, reaching its peak between the ages of 20 and 80 [3].

Relapse and syncope: The overlooked role of internal carotid artery stenosis

This case describes the unique presentation of a relapse in a 62-year-old man, who was ultimately diagnosed with significant ICA stenosis. Physical examination and objective evaluation should be done comprehensively to determine the underlying cause. Cardiovascular diseases, such as arrhythmias and other heart diseases, are often diagnosed first, followed by neurogenic causes such as seizures and autonomic dysfunction [4]. However, vascular causes, especially those involving large blood vessels in the brain, are rarely considered. This observation may delay diagnosis and appropriate treatment and increase the risk of serious cerebrovascular disease such as stroke. However, diagnosis and knowledge of the rare side effects of this disease, such as syncope due to internal carotid artery stenosis, are still limited [5].

Current guidelines and management strategies for internal carotid artery stenosis

For symptomatic carotid stenosis, the European Society of Cardiology (ESC) guidelines currently set revascularization guidelines at 70% stenosis. Revascularization should be discussed and sometimes may be considered for symptomatic carotid stenosis >50% and asymptomatic carotid stenosis >60%. The test should be performed using ultrasound as the initial examination method. Additionally, computed tomography angiography (CTA) and/or magnetic resonance angiography (MRA) are generally recommended to assess the extent and severity of extracranial carotid stenosis. In the long term, new high-risk markers are now being developed using markers of plaque neovascularization, plaque inflammation, or plaque stiffness [6]. Medical treatment of patients with carotid stenosis is always necessary and applies to all patients with atherosclerotic lesions. The best treatment is based on the treatment of heart disease and includes lifestyle interventions and drug therapy. It is a triple therapy strategy based on antiplatelets, statins, and ACE inhibitors or ARBs [7]. ICA stenosis is divided into symptomatic and asymptomatic. Symptomatic ICA stenosis can be treated according to its severity of stenosis by surgical techniques using conservative treatment, endovascular stent placement, or carotid endarterectomy. Patients should be treated accordingly and the length of stay should be as short as possible [8]. Accurate diagnosis and timely intervention are essential to prevent serious complications such as stroke, which can have a significant impact on morbidity and mortality. These data highlight the need for more clinical alerts and better methods for syncope monitoring, especially in confined settings [9].

New insights and importance of this case report

This case is significant because it highlights an uncommon yet critical cause of recurrent syncope—internal carotid artery stenosis—which is often overlooked in the diagnostic process, especially in resource-limited settings. Unlike more frequently considered causes of syncope such as cardiac arrhythmias and neurogenic disorders, vascular causes like ICA stenosis are rarely the initial focus. This case demonstrates the importance of considering vascular etiologies early in the diagnostic workup to avoid delays in treatment and prevent severe cerebrovascular events such as stroke. Moreover, it emphasizes the need for heightened clinical awareness and access to advanced diagnostic tools in under-resourced areas, where prompt intervention could significantly improve patient outcomes.

Case presentation

A 62-year-old man from Dhaka, Bangladesh, was admitted to the emergency department with a history of recurrent syncopal attacks 6 months ago. These syncopes are characterized by sudden, brief loss of consciousness, each lasting a few seconds to minutes, followed by recovery without post-traumatic stress disorder or nervous system dysfunction. Patients report experiencing these attacks without other symptoms such as palpitations, chest pain, or shortness of breath. He also sometimes felt dizzy and fuzzy, which made him feel tired and anxious. He had no known history of diabetes, cardiovascular disease, or previous cerebrovascular accident. There was no family history of sudden death or stroke. His lifestyle includes a sedentary lifestyle and he neither smokes nor drinks alcohol. On physical examination, the patient was conscious, and vital signs were stable. Cardiac examination shows a regular heartbeat and no murmurs or gallops. Note that a right carotid murmur was detected. Neurological examination revealed no abnormalities and no signs of focal defects or peripheral neuropathy. An electrocardiogram (ECG) showed normal sinus rhythm without ischemic changes or arrhythmias. Echocardiographic examination showed normal left ventricular function with no signs of heart disease, no regional wall motion abnormality, or valvular abnormalities. Due to the absence of cardiac findings, additional neurogenic and vascular examinations were performed. Digital subtraction angiography (DSA) of the brain and neck revealed severe stenosis (approximately 90%) of the right internal carotid artery at the clinoid segment (Figs. 1 and 2). It also confirmed high-grade stenosis and increased peak systolic pressure. There are no signs of infarction or obvious intracranial atherosclerotic disease (Fig. 3). Medical treatment begins with antiplatelet therapy (aspirin), statins, and antihypertensive medications to optimize vascular risk. Considering the severity of the stenosis and recurrent symptoms, the patient was referred for endovascular surgery consultation. After a detailed discussion about risks and benefits, carotid stenting was performed. The postoperative period was uneventful and the patient's symptoms improved. He reported no further syncope episodes or visual disturbances during follow-up. Repeat duplex ultrasonography showed good postoperative change with no signs of residual or recurrent stenosis. Patients are advised to continue antiplatelet therapy, statins, and antihypertensive medications, as well as lifestyle changes, including regular physical activity and diet, to reduce the risk of cardiovascular disease.

Fig. 1 – Digital subtraction angiography (DSA) revealing stenosis of the internal carotid artery of right side with approximately 90% luminal stenosis in the clinoid part of ICA (segment C5).

Fig. 2 – A closer view of Digital subtraction angiography (DSA) showing stenosis of the internal carotid artery of right side with approximately 90% luminal stenosis in the clinoid part of ICA (segment C5).

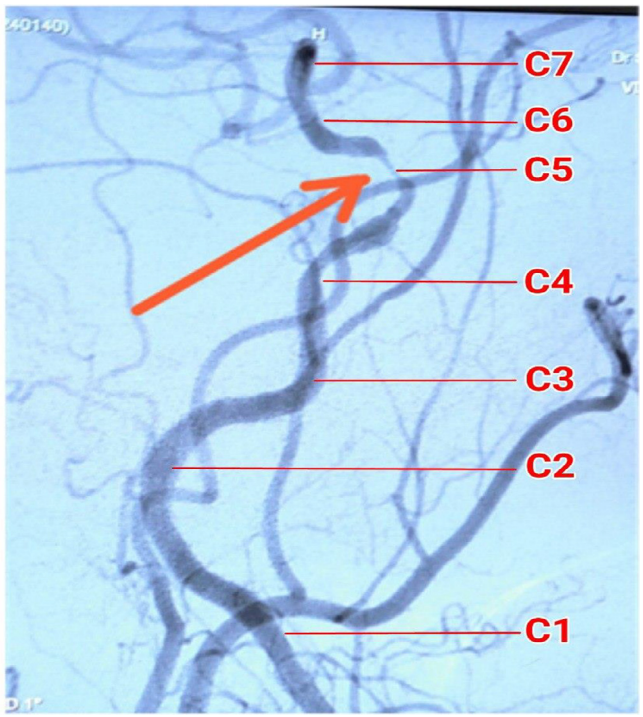

Fig. 3 – Anatomical segmentation of the internal carotid artery and detailed visualization of key vascular landmarks with the stenosis site (The internal carotid artery can be divided into several anatomical segments: the C1 (Cervical segment), which runs through the neck; the C2 (Petrous or horizontal segment), located within the temporal bone; the C3 (Lacerum segment), which passes through the foramen lacerum; the C4 (Cavernous segment), found within the cavernous sinus; the C5 (Clinoid segment), adjacent to the anterior clinoid process; the C6 (Ophthalmic or supraclinoid segment), which gives rise to the ophthalmic artery; and the C7 (Communicating segment), which connects to the circle of Willis).

Discussion

This case presentation highlights several important aspects of the conscientious evaluation and congruous treatment of syncope, especially when significant internal carotid artery (ICA) stenosis is a potential offender. Although syncope due to carotid artery stenosis is often masked by various cardiovascular and neurogenic reasons, it is still an important life-threatening condition [10,11]. Atherosclerotic carotid artery disease is one of the most common causes of ischemic stroke and transient ischemic attack (TIA) and accounts for approximately 10%-15% of patients, depending on the etiology and classification system [12]. Understanding the underlying process and using the correct approach is critical to effective patient care. In this case, syncope is caused by a decrease in cerebral blood flow. Think of the ICA as the main pathway supplying oxygenated blood to the brain. When a high degree of stenosis (stenosis) occurs, this main artery narrows, preventing blood flow. Physical and postural changes (such as standing up) or other factors that affect blood pressure can cause further damage. Therefore, the brain is deprived of the necessary blood supply, causing temporary disturbance in consciousness. Vascular evaluation is required

when evaluating syncope in patients with a history of cardiovascular complications such as high blood pressure and cholesterol. A physical examination can provide valuable information [13,14].

The discovery of a carotid murmur (an abnormality caused by blood flow through a narrowed artery) may be a red flag that requires further investigation. Advanced imaging technologies such as magnetic resonance angiography (MRA) and carotid ultrasound have become important tools [15]. While MRA provides detailed, noninvasive images of the arteries, duplex ultrasound uses sound waves to visualize the structure and blood flow in the carotid arteries, ultimately helping to determine the presence and severity of stenosis [16]. Treatment of advanced carotid stenosis generally has 2 methods: medical and surgical. Pharmacological treatment aims to elucidate underlying risk factors. Antiplatelet drugs such as aspirin help prevent blood clots from forming, while statins lower cholesterol and reduce plaque in the arteries. These drugs play a substantial role in heart failure and other cardiovascular diseases [17]. Antihypertensive drugs play a monumental role in controlling blood pressure and assuring adequate brain perfusion [18].

However, in patients with severe and recurrent syncope attacks, surgical intervention will be needed. There are 2 major surgeries: carotid endarterectomy and carotid stenting. A procedure like carotid endarterectomy involves surgical removal of plaque from the narrowed artery, which increases the luminal diameter. On the contrary, carotid stenting uses a mesh tube placed inside the artery to keep the artery open and control blood flow [19,20]. The choice of this surgery depends on many factors, including the patient's body and general health status. Carotid artery stenting (CAS) is an effective treatment for averting secondary stroke in patients with symptomatic carotid stenosis [21]. Although CAS has been associated with a higher incidence of surgical stroke compared to carotid endarterectomy (CEA) in studies such as the Carotid Revascularization and Stenting Study and the International Carotid Stenting Study (ICSS), this increased risk appears to be limited only to adults [22]. Studies have shown that endarterectomy alone substantially reduces the risk of stroke in 50% to 69% of patients with mild carotid stenosis [23].

This document also demonstrates the benefits of collaboration. Neurologists have expertise in the diagnosis and treatment of neurological diseases, and cardiologists play an important role in the diagnosis of heart diseases. Vascular physicians can perform critical interventions to resolve carotid artery stenosis [24,25]. This collaborative approach provides comprehensive care that addresses the patient's needs from multiple perspectives and maximizes outcomes. Patient education and lifestyle changes are important aspects of long-term treatment. Therefore, the symptoms of advanced carotid stenosis predict a specific risk for future stroke. Intervention with an open or endovascular approach may reduce this risk. Under appropriate conditions, carotid stenting may be a safe and effective alternative to carotid endarterectomy [26]. Educating patients about their condition, risk factors, and medication adherence can help them take control of their health. Promoting lifestyle changes such as a healthy diet, regular exercise, and quitting smoking can help reduce the risk of relapse and improve overall health [27,28].

In a region like Bangladesh, where medical facilities are limited, this is a strong warning for physicians to have high index of suspicion. It is important to increase physician awareness of recognizing the various causes of syncope, including the rare carotid artery stenosis. It also emphasizes the need for a comprehensive examination to determine the cause where there is a strong prevalence of risk factors for cardiovascular diseases [29]. Early diagnosis and timely intervention in cases of syncope can affect patient outcomes [30]. By optimizing diagnosis and treatment, doctors can prevent serious complications such as stroke and improve patient's quality of life. This information is a powerful call to action that encourages everyone to be vigilant, cooperative, and able to prevent cerebrovascular disease.

Conclusion

This case of a 62-year-old male with recurrent syncope due to internal carotid artery stenosis underscores the importance of considering vascular etiologies in the evaluation of syncope, especially in patients with multiple risk factors. Timely diagnosis and coordinated management, including carotid stenting, resulted in complete symptom relief and a reduced risk of future cerebrovascular events. The case highlights the need for increased clinical awareness and thorough screening for syncope, particularly in resource-limited settings. Future advancements in biomarkers and advanced imaging techniques may further enhance the early detection and management of ICA stenosis, ultimately improving patient outcomes.

Patient consent

Written informed consent for publication of this case report was obtained from the patient(s). The patient(s) were provided with sufficient information regarding the nature of the publication, including the details to be disclosed and potential implications. The patient(s) have confirmed their understanding and voluntarily agreed to the publication of this case report.

REFERENCES

[1] Masuda S, Revaiah PC, Kageyama S, Tsai TY, Miyashita K, Tobe A, et al. Quantitative coronary computed tomography assessment for differentiating between total occlusions and severe stenoses. J Cardiovasc Comput Tomogr 2024;18(5):450–6. doi:10.1016/j.jcct.2024.04.013.

[2] Grossman SA, Badireddy M. "Syncope,". StatPearls, Treasure IslandFL: StatPearls Publishing; 2024. Accessed: June 5, 2024 [Online] Available http://www.ncbi.nlm.nih.gov/books/NBK442006/ .

[3] Saklani P, Krahn A, Klein G. "Syncope,". Circulation 2013;127(12):1330–9. doi:10.1161/CIRCULATIONAHA.112.138396.

[4] Lemery R. The autonomic nervous system and the origins of neurocardiology. J Cardiovasc Electrophysiol 2024;35(8):1665–72. doi:10.1111/jce.16307.

[5] Hou X, Jie C, Liu Z, Bi X, Deng Y, Li Y, et al. Changes in the retina and choroid in patients with internal carotid artery stenosis: a systematic review and meta-analysis. Front Neurosci 2024;18:1368957. doi:10.3389/fnins.2024.1368957.
[6] Zhao TY, Xu GQ, Xue J-Y, Bai W-X, Cai D-Y, Yang B-W, et al. Significance of atherosclerotic plaque location in recanalizing non-acute long-segment occlusion of the internal carotid artery. Sci Rep 2024;14:10945. doi:10.1038/s41598-024-61938-y.
[7] Messas E, Goudot G, Halliday A, Sitruk J, Mirault T, Khider L, et al. Management of carotid stenosis for primary and secondary prevention of stroke: state-of-the-art 2020: a critical review. Eur Heart J Suppl 2020(22(Suppl M):M35-M42). doi:10.1093/eurheartj/suaa162.
[8] Haffner MN. Leitlinien zur Versorgung symptomatischer und asymptomatischer Stenosen der A. carotis interna [Guideline for the management of symptomatic and asymptomatic internal carotid artery stenosis]. Radiologie (Heidelb) 2024;64(9):710–15. doi:10.1007/s00117-024-01309-w.
[9] Bao MQ, Chen YN, Jin JW, Gui DD, Wang J, Chen SS, et al. Role of carotid ultrasonography combined with monocyte/HDL ratio in internal carotid artery stenosis. Curr Med Imaging 2024;20:e15734056289735. doi:10.2174/0115734056289735240409083434.
[10] Brouwers JJWM, Jiang JFY, Feld RT, van Doorn LP, van Wissen RC, van Walderveen MAA, et al. A new doppler-derived parameter to quantify internal carotid artery stenosis: maximal systolic acceleration. Ann Vasc Surg 2022;81:202–10. doi:10.1016/j.avsg.2021.09.056.
[11] Xu S, Zhang J, Yang J, Mao J, Mao B, Chen Q, et al. Evaluating the association between vascular remodeling and plaque calcification patterns of the carotid artery and its effects on ischemic symptoms using CT angiography. Cardiovasc Diagn Ther 2024;14(2):229–39. doi:10.21037/cdt-23-428.
[12] Bonati LH, Kakkos S, Berkefeld J, de Borst GJ, Bulbulia R, Halliday A, et al. European Stroke Organisation guideline on endarterectomy and stenting for carotid artery stenosis. Eur Stroke J 2021;6(2) I-XLVII. doi:10.1177/23969873211012121.
[13] Ma L, Wang F, Feng H, Yan S, Xu JC, Cheng YS, et al. Endovascular treatment of symptomatic severe intracranial atherosclerotic stenosis with a novel intracranial dedicated drug-eluting stent: a more effective treatment approach. Front Neurol 2024;15:1304524. doi:10.3389/fneur.2024.1304524.
[14] Xu M, Yan P, Zhao Y, Wang H, Sun Q, Du Y. Neurosonological parameters may predict the risk of cerebral hyperperfusion syndrome after carotid artery stenting. World Neurosurg 2024;187:e77–85. doi:10.1016/j.wneu.2024.04.001.
[15] Wu CH, Chen ST, Chen JH, Chung CP, Luo CB, Yuan WH, et al. Diagnosis of extracranial carotid stenosis by MRA of the brain. Sci Rep 2021;11:12010. doi:10.1038/s41598-021-91511-w.
[16] Almohammad M, Dadak M, Götz F, Donnerstag F, Tryc AB, Mahmoudi N, et al. The potential role of diffusion weighted imaging in the diagnosis of early carotid and vertebral artery dissection. Neuroradiology 2022;64(6):1135–44. doi:10.1007/s00234-021-02842-4.
[17] Sahota IS, Maxey C, Pournazari P, Sheldon RS. Clusters, gaps, and randomness: vasovagal syncope recurrence patterns. JACC Clin. Electrophysiol. 2017;3(9):1046–53. doi:10.1016/j.jacep.2017.02.008.
[18] Hackam DG. Optimal medical management of asymptomatic carotid stenosis. Stroke 2021;52(6):2191–8. doi:10.1161/STROKEAHA.120.033994.
[19] Almallouhi E, Nelson AM, Cotsonis G, Harris W, Chimowitz MI, Turan TN. Ameliorating racial disparities in vascular risk factor management with aggressive medical management in the SAMMPRIS trial. Stroke 2023;54(9):2235–40. doi:10.1161/STROKEAHA.122.042055.
[20] Donners SJA, Rots ML, Toorop RJ, van der Lugt A, Bonati LH, de Borst GJ. Long-term stroke risk in patients with new ischemic brain lesions on MRI After carotid revascularization. Stroke 2023;54(10):2562–8. doi:10.1161/STROKEAHA.123.043336.
[21] de Waard DD, de Vries EE, Huibers AE, Arnold MM, Nederkoorn PJ, van Dijk LC, et al. A clinical validation study of anatomical risk scoring for procedural stroke in patients treated by carotid artery stenting in the international carotid stenting study. Eur J Vasc Endovasc Surg 2019;58(5):664–70. doi:10.1016/j.ejvs.2019.04.035.
[22] Bosch FT, Hendrikse J, Davagnanam I, Bonati LH, van der Lugt A, van der Worp HB, et al. Optimal cut-off criteria for duplex ultrasound compared with computed tomography angiography for the diagnosis of restenosis in stented carotid arteries in the international carotid stenting study. Eur Stroke J 2017;2(1):37–45. doi:10.1177/2396987316678361.
[23] Barnett HJ, Taylor DW, Eliasziw M, Fox AJ, Ferguson GG, Haynes RB, et al. Benefit of carotid endarterectomy in patients with symptomatic moderate or severe stenosis. North American Symptomatic Carotid Endarterectomy Trial Collaborators. N Engl J Med 1998;339(20):1415–25. doi:10.1056/NEJM199811123392002.
[24] Costalat V, Jovin TG, Albucher JF, Cognard C, Henon H, Nouri N, et al. Trial of thrombectomy for stroke with a large infarct of unrestricted size. N Engl J Med 2024;390(18):1677–89. doi:10.1056/NEJMoa2314063.
[25] Joundi RA, Smith EE, Mandzia J, Ganesh A, Menon BK, Rempel JL, et al. Effect of endovascular thrombectomy for acute ischemic stroke on cognitive outcomes: a secondary analysis of the ESCAPE trial. Neurology 2024;102(10):e209270. doi:10.1212/WNL.0000000000209270.
[26] Kaye JM, Mejia-Munne JC, Grossman AW, Shirani P, Smith MS, Prestigiacomo CJ. Stenting in high-grade internal carotid artery stenosis: 2-dimensional operative video. Oper. Neurosurg. 2021;21(2):E128. doi:10.1093/ons/opab125.
[27] de Vries TI, Dorresteijn JAN, van der Graaf Y, Visseren FLJ, Westerink J. Heterogeneity of treatment effects from an intensive lifestyle weight loss intervention on cardiovascular events in patients with type 2 diabetes: data from the look AHEAD trial. Diabetes Care 2019;42(10):1988–94. doi:10.2337/dc19-0776.
[28] Oikonomou EK, Spatz ES, Suchard MA, Khera R. Individualising intensive systolic blood pressure reduction in hypertension using computational trial phenomaps and machine learning: a post-hoc analysis of randomised clinical trials. Lancet Digit. Health 2022;4(11):e796–805. doi:10.1016/S2589-7500(22)00170-4.
[29] van Dijk N, Quartieri F, Blanc JJ, Garcia-Civera R, Brignole M, Moya A, et al. Effectiveness of physical counterpressure maneuvers in preventing vasovagal syncope: the Physical Counterpressure Manoeuvres Trial (PC-Trial). J Am Coll Cardiol 2006;48(8):1652–7. doi:10.1016/j.jacc.2006.06.059.
[30] Gurevitz O, Barsheshet A, Bar-Lev D, Zimlichman E, Rosenfeld GF, Benderly M, et al. Tilt training: does it have a role in preventing vasovagal syncope? Pacing Clin Electrophysiol 2007;30(12):1499–505. doi:10.1111/j.1540-8159.2007.00898.x.