

Cervical Radiculopathy Presenting as Ischemic Stroke After Carotid Artery Stent Placement

Itzhak Brook^{a, c}, Bilaal Sirdar^b, Andrew Stemer^b

Abstract

Abrupt loss of focal brain function is the main characteristic of the beginning of ischemic stroke. However, individuals with disorders other than stroke can also present with similar features. These conditions include seizure disorders, migraine, central nervous system abscess or tumor, head trauma, subdural hematoma, cerebral venous thrombosis, viral encephalitis, conversion reaction, hypertensive encephalopathy, multiple sclerosis, and spinal cord disorder. An 82-year-old man presented with a sudden onset of numbness in his left forearm in the distribution of C6 and C7 spinal nerves, 2 days after undergoing endarterectomy and stent placement in his right carotid artery because of stenosis. He was diagnosed with hypopharyngeal squamous cell carcinoma (T1, L0, M0) 17 years earlier (2006) which was treated with 70 Gy intensity-modulated radiotherapy (IMRT). The patient underwent stent insertion into his left carotid artery 3.5 years earlier because of 80% carotid artery stenosis. He was initially suspected to have an ischemic stroke. However, computed tomography angiography of the head and neck did not show stenosis or occlusion of the major intracranial arteries and no aneurysms were identified. It showed interval stenting of the cervical portion of the right carotid artery and stable appearance of left carotid artery stent. Both carotid artery stents and the vertebral arteries were patent. The cervical spine showed bilateral moderate to severe foramen stenosis in C3-C4 and C5-C6, and moderate to severe stenosis in the right C2-C3 and left C4-C5. His symptoms subsided after performing neck extension exercises. This is the first report of a patient whose cervical radiculopathy symptoms were suspected to be caused by ischemic stroke. The recent angioplasty and stent placement in the right carotid artery made the association more likely and had to be excluded. Clinicians should be aware that cervical radiculopathy could present as ischemic stroke. It is therefore important that disorders that cause symptoms similar to ischemic stroke are also considered in these individuals.

Manuscript submitted October 2, 2023, accepted November 10, 2023
Published online November 23, 2023

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doi: <https://doi.org/10.14740/jmc4162>

Keywords: Cervical radiculopathy; Carotid artery; Stent; Ischemic stroke; Stenosis

Introduction

Abrupt loss of focal brain function is the main characteristic of ischemic stroke [1]. However, individuals with disorders other than stroke can also present with similar symptoms. These conditions include seizure disorders, migraine, central nervous system abscess or tumor, head trauma, subdural hematoma, cerebral venous thrombosis, viral encephalitis, conversion reaction, hypertensive encephalopathy, multiple sclerosis, and spinal cord disorder (e.g., vertebral radiculopathy, compressive myelopathy, spinal dural arteriovenous fistula) [2-4].

This case report describes a patient who presented with sudden onset of sensory deficit in his left arm 2 days after undergoing endarterectomy and stent placement in his right carotid artery. He was initially suspected to suffer from an ischemic stroke, but eventually his symptoms were determined to be caused by cervical radiculopathy.

Case Report

Investigations

An 82-year-old man presented to the emergency department with sudden onset of numbness of the lateral half of his left arm. The patient underwent proximal right carotid artery angioplasty and stent placement in his right carotid artery because of 74.2% carotid artery stenosis 2 days earlier. Residual stenosis after the procedure was under 45% via North American Symptomatic Carotid Endarterectomy Trial (NASCET) criteria. Dyna brain computed tomography (CT) scan following the procedure confirmed absence of infarct or hemorrhage.

The patient was diagnosed with hypo-pharyngeal squamous cell carcinoma (T1, L0, M0) 17 years earlier (2006) which was treated with 70 Gy intensity-modulated radiotherapy (IMRT). The cancer recurred (T2, L0, M0) 2 years later (2008) requiring bilateral radical neck dissection and total laryngectomy. Restoration of his larynx was performed using a left forearm free flap. He had no signs of tumor recurrence since then. He was speaking using an esophageal-tracheal voice prosthesis.

The patient underwent angioplasty and stent insertion into his left carotid artery 3.5 years earlier because of 80% carotid artery stenosis.

The patient suffered from mild to severe osteoarthritis of his knees and shoulders, fibrosis of his neck, peripheral neuropathy in his legs, xerostomia, dysphagia, hypothyroidism, diverticulosis, mild psoriasis, and migraines. He did not smoke or consume alcohol. He developed paroxysmal hypertension 4 years after receiving the radiation therapy (2000), which was ameliorated following the placement of a stent into the left carotid artery [5].

The patient underwent periodical Doppler ultrasound examination every 6 months and a severe right carotid artery stenosis was noted 3 weeks earlier. He experienced increased dizziness, fatigue and “brain fog” in the past 4 months.

Diagnosis

On presentation, his temperature was 36.7 °C, his blood pressure was 166/86 mm Hg, pulse was 87/minute, oxygen saturation was 97%, and respiration was 18 breaths/minute. Blood gases showed pCO₂ venous 36.3 mm Hg, pO₂ venous 32.1 mm Hg, HCO₃⁻ 26.0 mmol/L, TCO₂ venous 26 mmol/L, base excess/deficit venous 2.2 mmol/L, and O₂ saturation venous calculated 66.1%.

Physical examination showed the patient to be alert and oriented and in mild distress; no respiratory distress; lungs were clear to auscultation with good air exchange, no crackles, and no wheeze; heart and cardiovascular showed normal heart rate, regular rhythm, normal S1, and S2; there was no peripheral edema or venous distension; distal pulses were strong and equal in all limbs; and there was moderate right carotid artery bruit.

He had numbness of his left forearm in the distribution of C6 and C7 and C6 and C7 cervical nerves. Neurological examination did not show any muscle weakness, and all deep tendon reflexes were adequate. Vision acuity and eye movement were adequate. Pupils were equal and reactive to light. The rest of the neurological examination was intact.

Laboratory results showed Hgb 14.1 g/dL, Hct 39.9%, red blood cell count (RBC) 4.31 cells/ μ L, white blood cell count (WBC) $5.62 \times 10^3/\mu$ L, lymphocytes 35.8%, monocytes 2%, eosinophils 1.4%, basophiles 0.2%, absolute neutrophils $3.4 \times 10^3/\mu$ L, absolute lymphocytes $2.0 \times 10^3/\mu$ L, absolute monocytes 100/ μ L, absolute basophiles 0/ μ L, platelets $1.87 \times 10^5/k$ / μ L, mean platelet volume (MPV) 10 fL, mean corpuscular hemoglobin (MCH) 32.7 pg, mean corpuscular hemoglobin concentration (MCHC) 35.3 g/dL, red cell distribution width (RDW) 13%, prothrombin time (PT) 13.1 s, and international normalized ratio (INR) 1.0.

Sodium was 138 mEq/L, potassium was 4.2 mEq/L, chloride was 106 mEq/L, CO₂ was 22 mmol/L, blood urea nitrogen (BUN) was 14 mg/dL, creatinine was 0.94 mg/dL, estimated CrCl was 58.83 mL/min, glucose was 105 mg/dL, calcium was 9.5 mg/dL, lactic acid was 1.07 mmol/L, and high-sensitivity troponin-I was 7 ng/L. Liver panel test and urinalysis were within normal limits.

The patient was receiving aspirin 320 mg/day, clopidogrel 75 mg/day, Synthroid 100 μ g/day, atenolol 6.25/day, and doxa-

zosin 0.5 mg/day.

CT angiography of the head and neck did not show stenosis or occlusion of the major intracranial arteries and no aneurysms were identified. It showed interval stenting of the cervical portion of the right carotid artery and stable appearance of left carotid artery stent. Both carotid artery stents and the vertebral arteries were patent (Fig. 1).

The cervical spine showed bilateral moderate to severe foraminal stenosis in C3-C4 and C5-C6, and moderate to severe stenosis in the right C2-C3 and left C4-C5 (Figs. 2 and 3).

Treatment

The patient recalled that he was diagnosed with cervical radiculopathy 15 years earlier. He started to perform neck extension exercises of slowly tilting his neck to the right side, holding the position for 5 s, and returning the neck to the upright, neutral position. After performing these exercises for 10 min, some of the left hand numbness subsided. It was concluded that the numbness in the left arm was due to cervical radiculopathy.

Follow-up and outcomes

The patient was discharged from the emergency department and was referred to the neurology clinic. He continued to perform neck extension exercises and the left hand numbness disappeared within 24 h.

The patient's cervical radiculopathy was treated conservatively by physical therapy with neck extension exercises.

Discussion

We report a patient who presented with a sudden onset of sensory deficit in his left arm 2 days after undergoing endarterectomy and stent placement in his right carotid artery. It was initially suspected that he suffered from an ischemic stroke, but eventually his symptoms were determined to be caused by cervical radiculopathy. The left hand numbness disappeared after performing cervical extension exercises.

The causes of radiculopathy can be either compressive or non-degenerative. Most radiculopathies originate from nerve root compression [6]. Causes of non-degenerative radiculopathy include infections (i.e., Lyme disease, herpes zoster), infiltration by tumor or granulomatous tissue, nerve root infarction or avulsion, demyelination, and inflammatory and neurodegenerative disorders [7].

Compressive cervical radiculopathy is a common cause of arm pain with or without sensory and motor dysfunction. It can affect any of the eight cervical nerve roots emerging from the spine. Its clinical signs are most often caused by nerve root compression due to cervical spondylosis or disc herniation [6, 8]. They include neck, shoulder, or arm pain or muscle weakness, sensory symptoms, or weakened deep tendon reflexes.

The management of most patients with compressive cervical radiculopathy with radicular pain with paresthesia or

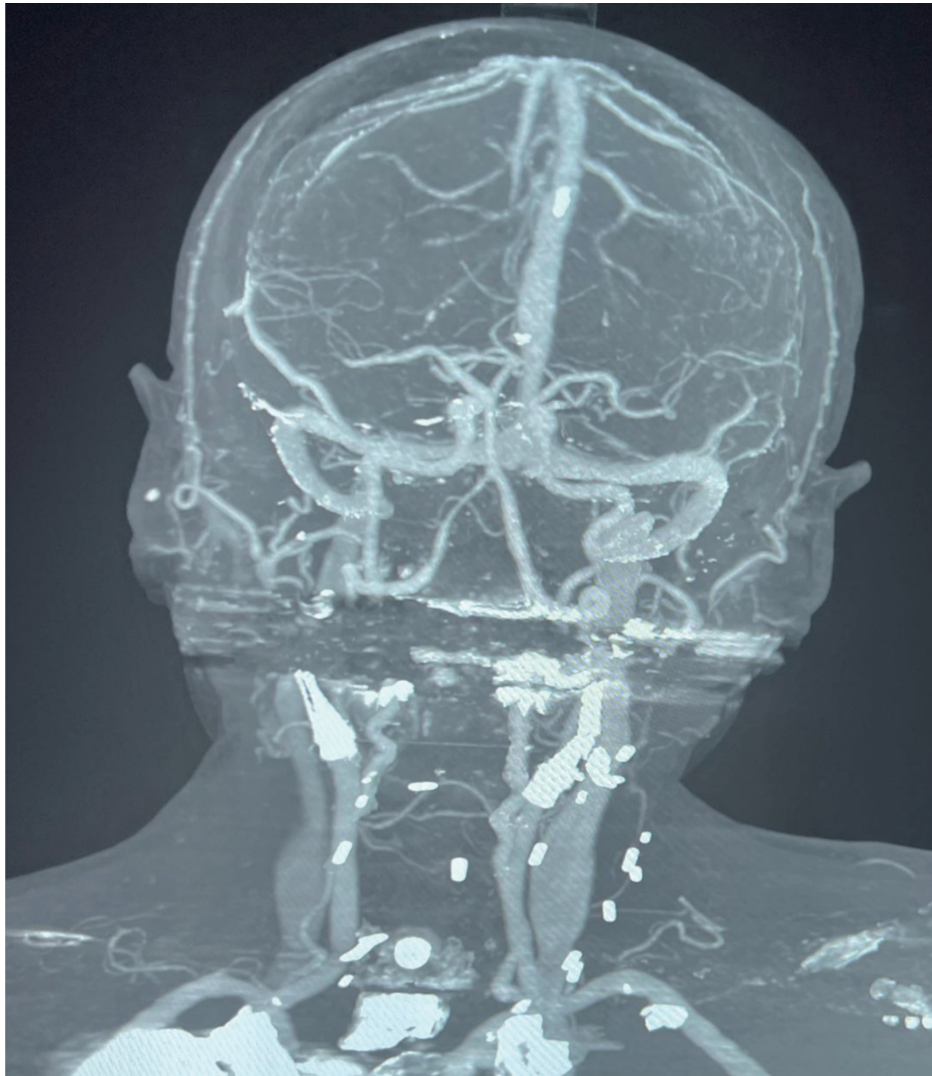


Figure 1. CT with contrast of the head. CT: computed tomography.

numbness, or non-progressive weakness without myopathy is mainly conservative. This includes administration of oral analgesics, a short course of oral prednisone if pain is severe, and physical therapy. The value of surgery for the treatment of cervical radiculopathy has not been clearly established.

Several techniques are available for those undergoing surgery for cervical radiculopathy without myelopathy [9]. A recent trial of 265 patients with cervical radiculopathy found that the efficacy and safety outcomes were similar for individuals assigned either to posterior foraminotomy or to anterior cervical discectomy with fusion [10].

The clinical diagnosis of cervical radiculopathy is primarily based on history and clinical examination. Further testing is usually not required for those who have minimal or no motor deficit and are not at high risk of having an underlying malignant, infectious, or inflammatory cause [8].

Our report is the first to describe a patient whose cervical radiculopathy symptoms were suspected to be caused by an ischemic stroke. The recent angioplasty and stent placement

in the right carotid artery made the association more likely and had to be excluded by CT scan with contrast.

Madedor et al [4] described a patient who presented with stroke symptoms of sudden balance impairment, prompting the stroke assessment protocol. However, further neurologic workup and imaging led to the ruling out of the initial diagnosis of stroke and the patient was eventually diagnosed with cervical spondylotic myelopathy.

Acute ischemic stroke is a severe and life-threatening emergency, especially when it is brought about by a large-vessel blockage. The only available two management choices are intravenous alteplase and endovascular treatment (mechanical clot removal), both of which are extremely time-dependent. Therefore, speedy patient transfer, diagnosis, and treatment are critical, and time-consuming imaging methods and overly selective management selection standards should be avoided. This is why patients who present with abrupt appearance of symptoms compatible with ischemic stroke generally generate a stroke code [3, 11-13]. Stroke protocol requires that hospital

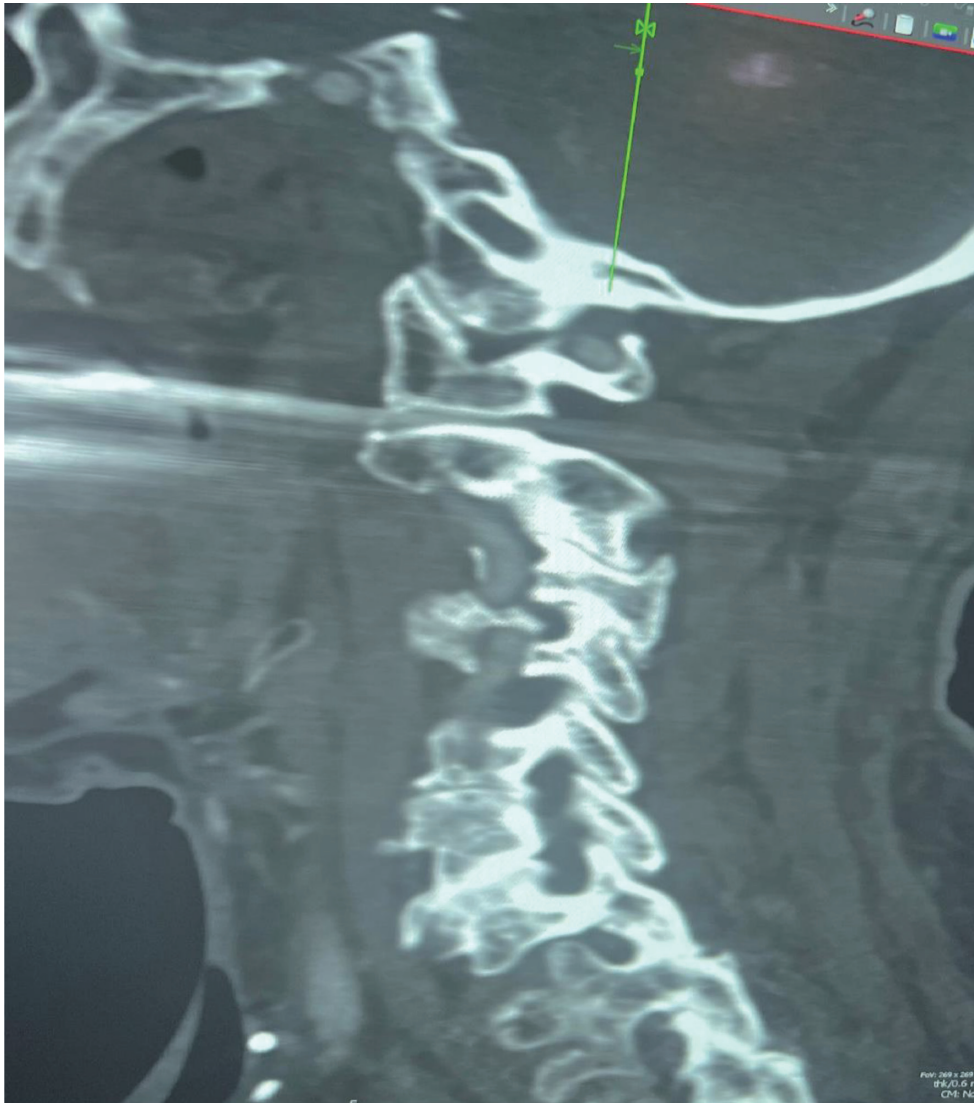


Figure 2. CT of the cervical spine: view of the left foramina showing moderate to severe foramen stenosis in C3-C4 and C5-C6 and severe stenosis in C4-C5. CT: computed tomography.

personnel and stroke team initiate diagnosis and treatment of a potential stroke as soon as the patient arrives at the emergency department [11-13].

Conclusions

Clinicians should be aware that cervical radiculopathy as well as other non-degenerative conditions could mimic an ischemic stroke. Causes of non-degenerative radiculopathy include infections (i.e., Lyme disease, herpes zoster), infiltration by tumor or granulomatous tissue, nerve root infarction or avulsion, demyelination, and inflammatory and neurodegenerative disorders [2-4]. It is therefore essential that other disorders that cause symptoms similar to ischemic stroke are also considered in these individuals especially in those who had a history of any of these conditions.

Learning points

Cervical radiculopathy could present as ischemic stroke. Disorders that cause symptoms similar to ischemic stroke should also be considered in patients who present with them.

Acknowledgments

The authors acknowledge the Jain Neil Kalpeshand, DO, and Anousheh Saya, MD, for reviewing the radiological studies.

Financial Disclosure

None to declare.

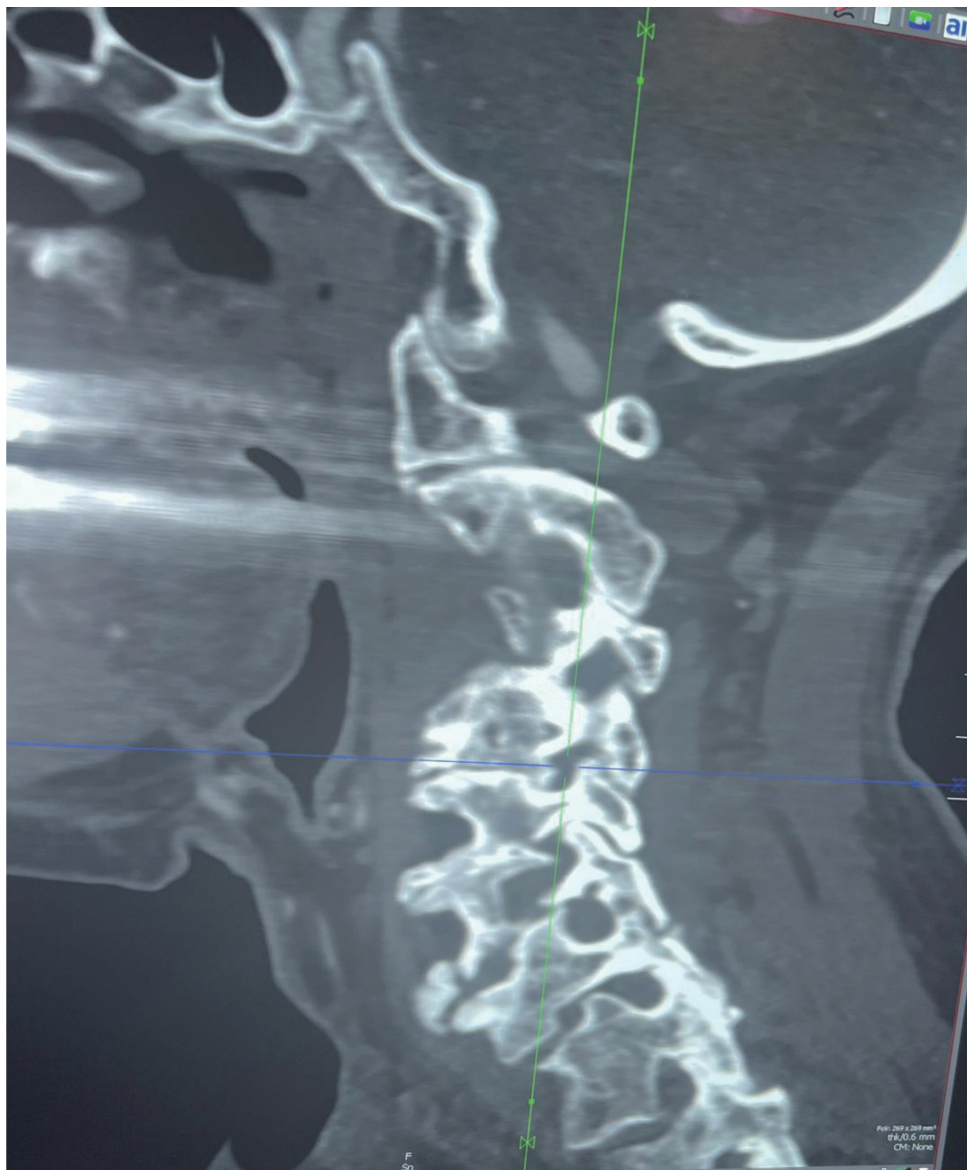


Figure 3. CT of the cervical spine: view of the right foramina showing moderate to severe foramen stenosis in C3-C4 and C5-C6 and severe stenosis in C2-C3. CT: computed tomography.

Conflict of Interest

None to declare.

Informed Consent

Informed consent has been obtained.

Author Contributions

All authors contributed to the writing/editing part of this paper. Itzhak Brook MD wrote the report, reviewed literature, and

contributed to the diagnosis. Bilaal Sirdar MD and Andrew Stemer MD edited and guided us in writing this manuscript.

Data Availability

The authors declare that data supporting the findings of this study are available within the article.

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