

Clinical Reasoning:

A 32-year-old woman with right-sided numbness and word-finding difficulties

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SECTION 1

A 32-year-old right-handed woman from El Salvador was brought into the emergency department (ED) because of confusion, right-sided numbness, and word-finding difficulties.

Her symptoms started that morning, while working at a laundromat, with sudden onset of right-sided tingling followed by transient right arm weakness and word-finding difficulties. She felt confused and had trouble recognizing familiar people around her. Emergency medical services were called, and en route to the hospital a brief episode of unresponsiveness occurred.

On examination in the ED, the patient was awake and alert but appeared confused, with evidence of mild aphasia: her speech was slow, with decreased fluency. She could follow only 1-step commands and was

unable to name “key,” describe an image, or state her occupation. She had mild right brachiofacial weakness and hemi-hypesthesia to pinprick, light touch, and vibration. Reflexes were symmetric throughout with an extensor plantar response on the right.

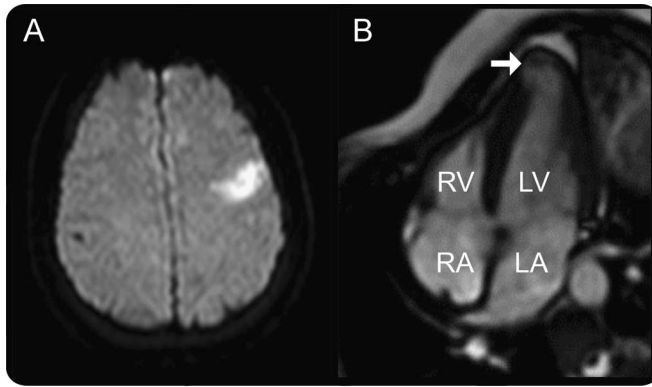
Review of her medical history revealed that she had presented 9 months earlier with a syncopal episode and right arm numbness. The workup at that time did not reveal a cause; gadolinium-enhanced MRI and EEG were unremarkable. Outpatient Holter monitoring was scheduled but the patient did not return for follow-up.

Questions for consideration:

1. What is your differential diagnosis at this stage?
2. What urgent studies should be done at this time?

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Figure MRI of brain (diffusion-weighted sequence) and cardiac MRI



(A) MRI brain (diffusion-weighted sequence) demonstrating restricted diffusion consistent with an acute infarct in the left frontal lobe. (B) Cardiac MRI showing fibrosis/scarring of apical septum and anterior wall, with aneurysm and dyskinesia of the apex. Arrow points to small mass on apical septum, likely thrombus. For orientation purposes, the 4 heart chambers are identified by RA (right atrium), LA (left atrium), RV (right ventricle), and LV (left ventricle).

SECTION 2

The patient's presentation of sudden aphasia with right brachiofacial weakness and sensory disturbance suggests an acute process affecting the left middle cerebral artery territory. The acuity of her symptoms raises concern for hemorrhagic or ischemic stroke, or seizure. Mass lesions or demyelinating diseases

typically have more insidious presentations but still deserve consideration.

This patient needs urgent head imaging to guide immediate management. A head CT, while less sensitive than MRI for identifying acute infarcts, is usually the study of choice because CT is readily available and can rule out intracranial hemorrhage or large mass lesions, thereby helping determine whether the patient is a candidate for IV thrombolysis with tissue plasminogen activator. Other imaging to consider includes vessel imaging with CT angiography or magnetic resonance angiography (MRA), and MRI for further delineation of the lesion.

In this patient, noncontrast head CT found no acute hemorrhage or other intracranial abnormality. An MRI/MRA of the head and neck demonstrated an area of restricted diffusion consistent with acute infarction of the left frontal lobe (figure, A), as well as small bilateral subcortical white matter nonenhancing fluid-attenuated inversion recovery hyperintensities (unchanged from a prior MRI). MRA of head and neck was unremarkable.

Questions for consideration:

1. What are the causes of stroke in young patients?
2. What are the next steps in working up this patient?

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SECTION 3

Although the risk of stroke is typically correlated with advancing age, the incidence of stroke in young patients is increasing.¹ It is important to know what causes need consideration in patients presenting with stroke at a young age (usually defined as younger than 45 years).

The most common identifiable causes of stroke in young patients are cardioembolism, dissection, hypercoagulability, and IV drug abuse. Therefore, it is important to examine the fundi (for embolic occlusions in retinal vessels) and skin (for signs of IV drug use or cutaneous evidence of cardioemboli). Neck pain and Horner syndrome may suggest ipsilateral carotid dissection. The cardiac assessment, including echocardiogram and telemetric monitoring, is of key importance as up to one-third of strokes in young people are caused by cardioemboli,² usually due to structural abnormalities (such as dilated cardiomyopathy), arrhythmias, or valve disease.

In our patient, lab tests, including complete blood count, chemistries, toxicology screen, thyroid-stimulating hormone, erythrocyte sedimentation rate, C-reactive protein, hypercoagulability panel, and lipid panel, were all normal. Frequent cardiac ectopy was noted on telemetric monitoring. On further questioning, the patient reported 8 years of episodic chest

pounding and palpitations. Recently these episodes had increased in frequency and were associated with lightheadedness and dizziness. She also complained of gastric reflux, difficulty swallowing (especially dry solids such as rice), and chronic constipation.

The patient underwent transthoracic and transesophageal echocardiography, which documented focal left ventricular apical hypokinesis and possible left ventricle (LV) apical aneurysm. Further evaluation with cardiac MRI (figure, B) demonstrated fibrosis/scarring of the apical septum and anterior wall. A small (4 × 4 mm) well-circumscribed mass consistent with thrombus was present on the endocardial side of the apical septum.

Given her dysphagia, the patient underwent a barium swallow that demonstrated delayed swallow contractions. A follow-up esophagogastroduodenoscopy showed normal esophageal and gastric lining, but a biopsy returned positive for *Helicobacter pylori*.

Questions for consideration:

1. How do this patient's cardiac findings relate to her presenting stroke?
2. Are there any other studies that should be done at this point?
3. What are the next steps in treatment for this patient?

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SECTION 4

The clinical constellation of cardiac apical aneurysm and decreased gastric motility in a young woman who grew up in rural El Salvador raised concerns for Chagas disease. Serologic tests for *Trypanosoma cruzi* were sent to the Centers for Disease Control and Prevention. Meanwhile the patient underwent cardiac electrophysiologic testing, which demonstrated provokable malignant arrhythmias originating from the apical scar. An implantable cardioverter defibrillator was placed to prevent sudden cardiac death. Given the high cardioembolic risk of the LV thrombus, she was placed on anticoagulation. She also received treatment for *H pylori*. Several weeks after discharge, the *T cruzi* antibodies returned positive, and she was started on a 2-month course of benznidazole.

DISCUSSION Chagas disease is an infectious disease caused by the flagellate protozoan *T cruzi*. The predominant route of infection is via vectorborne transmission by *Triatominae*, also known as “kissing bugs” (called “vinchucas” in areas of Latin America); these insects, found in many South American mud huts, acquire the parasite by feeding on the blood of an infected animal and then spread it by depositing feces contaminated with *T cruzi* while feeding on human hosts. The trypanosomes then enter the host via wounds in the skin or mucous membranes.³ Less commonly, infection occurs via blood transfusions or maternal-fetal transmission.³

Once in the human host, the parasites penetrate various cell types, with a predilection for myocytes and ganglion cells, where they multiply and then burst out of cells to reenter the bloodstream and restart the cycle.

There are 2 clinical phases of infection. The acute phase (4–8 weeks) is often asymptomatic but may present as induration at the site of infection (“chagoma”) followed by a self-limited febrile illness. Acute illness can be fatal (<5%–10% of symptomatic cases) and death may occur due to myocarditis or meningoencephalitis.⁴ Within 10–30 years of initial infection, as many as 40% of patients eventually develop signs of chronic Chagas disease.⁴ In chronic Chagastic cardiomyopathy, a gradual myocarditis leads to chamber dilation and impairment of contractile function. Focal wall motion abnormalities and aneurysmal dilation of the LV apex are common in the early chronic phase.⁵ The progressive destruction of cardiac fibers and subsequent fibrosis of the myocardium predisposes patients to heart failure and ventricular arrhythmias.⁵

Chagastic gastrointestinal disease is classically associated with dilation of the gastrointestinal tract and gastrointestinal motor disorders due to injury caused to the enteric nervous system. Dysphagia is the most common initial symptom, followed by gastrointestinal dilation (usually megacolon or megaesophagus/achalasia,

although stomach, small intestine, gallbladder, biliary tree, and salivary glands can also be affected⁶). Intriguingly, studies have found an association between Chagas disease and increased rates of *H pylori* infection.⁷

The diagnosis of Chagas disease is not yet standardized in the United States. There are 2 assays for *T cruzi* immunoglobulin G antibodies; however, neither has sufficient sensitivity and specificity to be used alone, so both are used in parallel and sometimes need to be repeated. Treatment consists of the antiprotozoal agents benznidazole or nifurtimox. During the acute phase of infection, antiprotozoal agents lead to a cure in 60%–85% of patients. There are limited data on the best treatment for chronic Chagas disease. It is not clear that antitrypanosomal agents affect the long-term course of the disease, as much of the damage seen in chronic Chagas is from inflammatory changes set off from the initial infection. An additional concern is that the medications themselves come with frequent side effects, and there are no randomized clinical trials demonstrating their effectiveness. However, it is reasonable to assume that decreasing the number of live parasites will result in less cumulative inflammatory response—therefore, at this time, treatment is recommended to slow progression of disease even in adults with long-standing infection.⁸

Chagas disease has traditionally been considered a tropical disease; most of the estimated 10 million people infected worldwide are in Central and South America, with the highest rates of infection in Bolivia, Argentina, and Paraguay. However, the prevalence is increasing in the United States and Europe because of emigration from endemic countries—by current estimates, there are now more than 300,000 individuals infected with *T cruzi* in the United States (and >5,500 in Canada, >80,000 in Europe, >3,000 in Japan, and >1,500 in Australia).⁹ Given its significance as a cause of cardiomyopathy, especially in young patients without other clear risk factors, it is an important disease to consider in patients originally from endemic countries presenting with embolic stroke.

AUTHOR CONTRIBUTIONS

Dr. Busza participated in the care of the patient and collected the clinical data, did background research, and drafted/revised the manuscript. Dr. Cervantes-Arslanian participated in the care of the patient, identified the patient as a good case report, and contributed to the planning and editing of the manuscript. Dr. Kase supervised the care of the patient and contributed to editing the final draft of the manuscript.

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report no disclosures relevant to the manuscript. Go to Neurology.org for full disclosures.

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