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Ischemic stroke as a presenting feature of neurosyphilis in an immunocompetent adult and attained complete recovery following treatment: a case report and review of the literature

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Abstract

Background Neurosyphilis typically presents with nonspecific symptoms such as behavioral changes or cognitive impairment, rather than an initial stroke.

Case presentation This case report describes a Black African man in his thirties who experienced sudden weakness on the left side of his body. Computed tomography suggested a nucleo-capsular ischemic lesion. However, given his young age and lack of traditional stroke risk factors, further investigations were pursued. Laboratory tests revealed positive results for syphilis in both blood and cerebrospinal fluid. Additional imaging (head and neck angiography) indicated intracranial vasculitis with widespread and acute ischemia in the right hemisphere. Treatment with ceftriaxone and aspirin was initiated. Through ongoing monitoring and care, the patient's neurological condition improved.

Conclusion The case underscores the critical need for prompt diagnosis and comprehensive assessment in patients experiencing stroke-like symptoms, especially in younger individuals. By recognizing neurosyphilis as a potential cause, healthcare providers can initiate timely treatment and improve patient outcomes.

Keywords Neurosyphilis, Stroke, Meningovascular syphilis, Immunocompetent adult, Rare

Introduction

Stroke is a leading cause of morbidity and mortality worldwide, characterized by sudden-onset neurological deficits resulting from disruption of blood flow to the brain [1]. Neurosyphilis is a rare but serious complication of untreated syphilis infection, involving invasion of the central nervous system by *Treponema pallidum*, the causative agent of syphilis [2].

After penicillin was developed and third-generation antibiotics were widely used, the prevalence of neurosyphilis decreased dramatically from between 10% and 20% during the pre-antibiotic era to extremely rare [3]. In line with syphilis epidemiological statistics, there has been a rise in neurosyphilis among individuals who have human immunodeficiency virus (HIV). However, it is still rare in people who are not HIV-positive [4, 5].

The clinical manifestations of neurosyphilis can vary widely, ranging from asymptomatic infection to severe neurological complications such as stroke, meningitis, and dementia [2]. A peculiar pathological presentation

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within the panorama of neurosyphilis is meningovascular syphilis (MVS) or meningovascular neurosyphilis. MVS is a distinct form of neurosyphilis characterized by a meningo-encephalopathic syndrome with superimposed cerebrovascular or myelovascular stroke-like events.

In immunocompetent adults, the central nervous system (CNS) can be affected at any stage of syphilis infection, although it most commonly occurs in later stages. Symptoms of neurosyphilis can be vague and varied, making diagnosis challenging. They may include headache, forgetfulness, mood swings, difficulty concentrating, and seizures. Neurological examination may reveal abnormalities in papillary reflexes, muscle tone, coordination, and gait [6, 7].

The association between neurosyphilis and stroke has been well-documented in the literature, with reports of syphilitic arteritis leading to vessel wall inflammation and subsequent thrombosis or hemorrhage [8]. In such cases, magnetic resonance imaging (MRI) with high-resolution vessel wall imaging can be useful for diagnosing stroke and depicting vessel wall inflammation associated with infectious vasculitis [9].

Diagnosis of neurosyphilis relies on a combination of blood tests and cerebrospinal fluid (CSF) analysis. Blood tests can detect antibodies against *Treponema pallidum*, but these tests can be nonspecific in neurosyphilis. CSF analysis is essential for definitive diagnosis. It typically shows elevated white blood cell count and protein levels and positive tests for *Treponema pallidum*-specific antibodies in the CSF [7, 10].

Antibiotic therapy and stroke management interventions are key components of treatment. Since the outcome of neurosyphilis is poor, especially among cases with late presentation, timely recognition and intervention are critical for optimizing patient outcomes and preventing further neurological complications [4, 10].

The prevalence of strokes in Ethiopia is estimated to be 15 per 100,000, and 6.23% of total deaths are stroke-related [11, 12]. According to Ethiopian national guidelines in 2023, the prevalence of HIV in Ethiopia is 1.1%, and around 605,238 persons are living with HIV [13]. Similar to many other low- and middle-income countries, the country faces challenges in healthcare infrastructure and access to diagnostic and treatment resources, potentially leading to underdiagnosis and underreporting of neurosyphilis cases [6].

In our literature review spanning over a decade, we found 15 cases of stroke and neurosyphilis, and only 1 of them described an immunocompetent young adult diagnosed with neurosyphilis leading to stroke [26]; the others had multiple concomitant comorbidities leading to immunodeficiency (Supplementary Table 1). This highlights the rarity of neurosyphilis presenting as a stroke in immunocompetent individuals without comorbidities, underscoring the importance of reporting such uncommon presentations. In this study, we report a rare manifestation of neurosyphilis as ischemic stroke in a young and immunocompetent patient. Our investigation results suggest syphilitic vasculitis involving both large-, medium-, and small-sized arteries. In addition, we discuss the natural history, clinical data, competing differential diagnosis, management with outcome, and literature reviews of "stroke and neurosyphilis."

Case presentation

We report a case of a man in his mid-thirties from Ethiopia who sought medical attention on 10 September 2023 at our territory hospital. He presented with sudden weakness on the left side of his body, which was maximal at onset. A total of 10 years prior to this incident, he experienced a nonspecific generalized body rash involving his trunk and groin area for which he did not seek medical care. The patient reported that his previous symptoms had resolved spontaneously. He identified as heterosexual with a history of multiple sexual partners and had engaged in unprotected and frequent sexual intercourse. At the time of evaluation, he was married and remained sexually active. He denied any history of alcohol consumption, smoking, intravenous drug use, or genital ulcers. Moreover, he reported no episodes of loss of consciousness or abnormal body movements. There was no history of muscle or joint pain, back or neck discomfort, joint stiffness, dizziness, or double vision. He also denied hemoptysis, psychological disorders, drug allergies, and childhood illnesses such as chickenpox, mumps, or smallpox. Furthermore, there was no personal or family history of diabetes mellitus, hypertension, sudden death, or related conditions.

At our emergency department, he was acutely sick, seeming in pain and agitated. His vital signs were as follows: blood pressure was 110/70 mmHg with no significant discrepancy between bilateral upper and lower extremities; pulse rate was 60 beats per minute, regular, and full in volume; respiratory rate was 22 breaths per minute; temperature was recorded at 36.7 ℃; and he was saturating at 92% on room air breathing. During the arterial examination, all accessible arteries were palpable with full volume bilaterally; however, a bruit was detected over the right carotid artery with no palpable carotid mass or tenderness. Upon neurological examination, he was conscious and oriented to time, place, and person with a Glasgow Coma Scale score of 15 out of 15. Motor examination revealed strength of 0/5 throughout the left side, involving both proximal and distal muscle groups of both upper and lower extremities, and 5/5 throughout

the right side upper and lower extremities. Notably, an equivocal response was elicited on the left plantar side.

Investigations

The initial routine blood tests showed no abnormalities, as presented in Table 1. A non-contrast brain computed tomography (CT) revealed a hypodense lesion in the right nucleocapsular region (Fig. 1). Both echocardiography and electrocardiogram were unremarkable. Bilateral carotid artery duplex showed an echogenic intraluminal focus and absent Doppler flow (Fig. 2). Further diagnostic imaging assessment included CT angiography of the head, neck, and upper extremity (CTA) (Fig. 3, video 1 and video 2). The results indicated right proximal internal carotid artery stenosis with a thickened enhancing wall, long-segment occlusion of the right internal carotid artery involving the cervical and intracranial segments with a contracted lumen, superimposed chronic arterial thrombus, and diffuse acute ischemic changes in the anterior circulation of the right cerebral hemisphere.

Table 1 Laboratory findings during the hospital stay

Variable	Reference range	
White cell count (per μ l)	4120	4000–15,000
Neutrophil (%)	56.6	37–72
Lymphocyte (%)	39.9	20–50
Hemoglobin (mg/dL)	13.8	11–16.5
Platelet (per μ l)	399,000	150,000–450,000
C-reactive protein (mg/L)	37 *	0–10
Hs-CRP (mg/L)	>5 *	0–1
ESR (mm/h)	25 *	≤ 20
Creatinine (mg/dL)	0.99	0.5–1.2
Blood urea nitrogen (mg/dL)	12.6	7–20
Sodium (mmol/L)	139	135–145
Potassium (mmol/L)	4.4	3.5–5.5
Chloride (mmol/L)	106	98–107
AST (IU/L)	41.3	0–40
ALT (IU/L)	44.3	0–41
ALP (IU/L)	139	40–130
Random blood glucose (mg/dL)	102	
Total cholesterol (mg/dL)	143	<200
Triglyceride (mg/dL)	56	0–150
HDL (mg/dL)	37.3	>45
LDL (mg/dL)	93.6	0–99.99
Prothrombin time (sec)	12.9	10–14
APTT (sec)	29.1	22–38
INR	1.06	0.7–1.3
TSH (μ IU/mL)	0.745	0.27–4.2
White cell count (per μ l)	22 *	
Lymphocyte (%)	75 *	
Granulocyte (%)	25 *	
Protein (g/L)	310 *	
Glucose (mg/dL)	72 *	
VDRL	Reactive*	
HIV test	Nonreactive	
Serum VDRL test	Reactive *	
Hepatitis B surface antigen test	Negative	
Hepatitis C antibody test	Negative	
Urinalysis	Unremarkable	

ESR erythrocyte sedimentation rate, *Hs-CRP* high sensitivity C-reactive protein, *VDRL* venereal disease research laboratory, *TSH* thyroid stimulating hormone, *HDL/LDL* high/low-density lipoprotein, *HIV* human immunodeficiency virus, *ALT* alanine transaminase, *AST* aspartate transaminase, *ALP* alkaline phosphatase, *APTT* activated partial thromboplastin time

*Impaired results

On the basis of the clinical and radiologic findings, vasculitis, including syphilis, was considered. The patient underwent further investigations, including C-reactive protein (CRP) testing, which revealed a level of 37.0 mg/dL. Serology testing for syphilis, including the venereal disease research laboratory (VDRL) test, returned positive results. Additionally, CSF analysis was performed, revealing a white blood cell count of 22 cells/μL, with 75% of the white blood cells being lymphocytes; protein was 31.0 mg/L. The CSF VDRL test also returned positive. Serologic tests for HIV, antinuclear antibodies, and virologic markers for hepatitis yielded negative results (Fig. 1).

Given the above findings, the patient was diagnosed with left-sided body weakness secondary to ischemic stroke caused by syphilitic vasculitis, extending from the right proximal carotid artery extending to the cervical and intracranial segments. Takayasu arteritis could not be ruled out at the time of diagnosis.

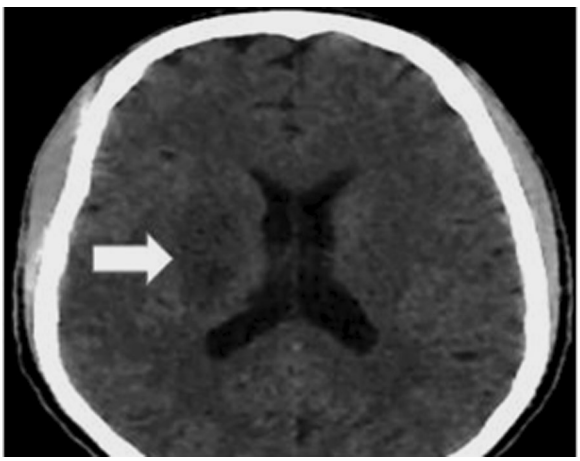


Fig. 1 An axial view of the non-contrast computed tomography scan showing right lenticular area and caudate nucleus hypodense lesion, as indicated by the arrow

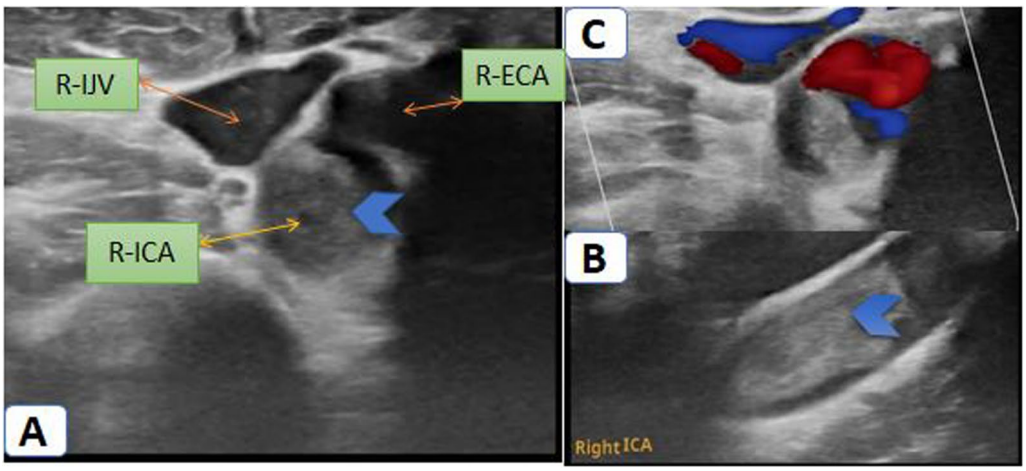


Fig. 2 Right carotid artery Doppler ultrasound. **A**–**B** B-mode transverse view showing echogenic focus in the right internal carotid artery (blue arrow head). *B* B-mode longitudinal view showing echogenic focus in the right internal carotid artery (blue arrow head). *C* Color-flow study showing absent luminal color-filling of right internal carotid artery (yellow arrow). *R-ICA* right internal carotid artery, *R-ECA* right external carotid artery, *R-IJV* right internal jugular vein

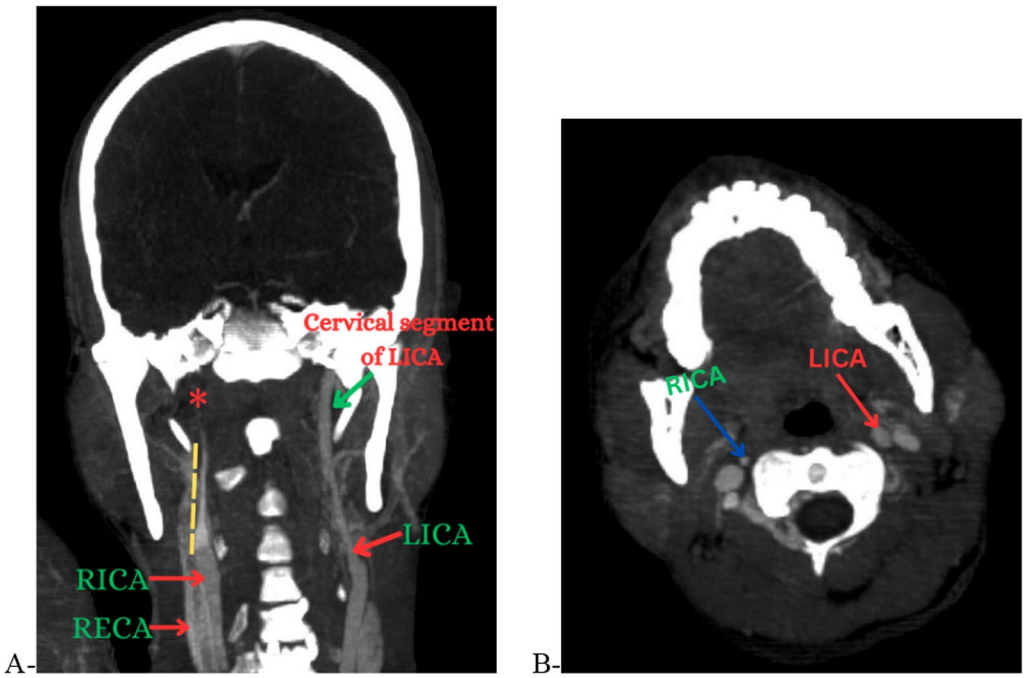


Fig. 3 Computed tomography angiography of head and neck. **A** Coronal view shows significant luminal narrowing of the proximal right internal carotid artery (yellow broken line) with total long-segment occlusion distally involving the rest of the cervical segment (asterisk). **B** Axial view at the level of cervical segment of right internal carotid artery shows significant caliber narrowing compared with the contralateral left internal carotid artery. *RICA/LICA* right/left internal carotid artery, *RECA* right external carotid artery (yellow arrow). **A** Red arrows with RICA, RECA and LICA and the green arrow (LICA) are included for anatomic demarcations. **B** RECA with blue arrow was included for anatomic demarcation

Treatment outcome and follow-up

On the basis of the above clinical, serologic, and radiologic findings, a diagnosis of left hemiplegia secondary to ischemic stroke caused by syphilitic vasculitis was considered, and the patient was admitted to the stroke unit. He received treatment with ceftriaxone 2 g intravenously daily for 10 days owing to a lack of availability of crystalline penicillin injection, as per the guidelines from

the Centers for Disease Control and Prevention (CDC) and aspirin for secondary prophylaxis and underwent regular physiotherapy. He was also instructed to attend monthly follow-up appointments to assess his expression of wellness and neurological improvement. During both his 30th day and fifth month post-discharge follow-up evaluations, significant progress was noted. Moreover, the partner was counseled regarding safe sexual practices and was screened negative for HIV. The patient exhibited a notable improvement in muscle strength, with a power rating of 5 out of 5 observed in both the upper and lower extremities. (Table 2).

Discussion

Neurosyphilis, a tertiary stage of syphilis, can present with various neurological manifestations, including stroke, meningitis, and cranial nerve palsies. Meningovascular involvement is the most frequent presentation owing to arteritis of the large- and medium-sized arteries and/or small-sized arteries. MRI with high-resolution vessel wall imaging may demonstrate cranial nerve and vascular involvement in syphilis [14]. Vasculitis in neurosyphilis manifests as Heubner's arteritis, affecting medium and large blood vessels, or Nissl–Alzheimer's arteritis, involving small brain vessels [41]. Both forms can cause vessel occlusion, leading to secondary ischemia and infarction and may occur concomitantly [42]. However, its occurrence as an isolated ischemic stroke, especially in young individuals, remains uncommon and warrants thorough investigation [15].

The association between syphilis and stroke has been documented in the medical literature. In our review of PubMed-published cases from 2009 to 2024 using the keywords "stroke" and "neurosyphilis," we identified 15 cases in which stroke was the initial manifestation of neurosyphilis [16–27]. Most cases involved young adults who were HIV-seropositive or had other immunocompromising conditions (Supplementary Table 1). Notably, we found only one case involving a 29-year-old immunocompetent patient who was diagnosed with a stroke secondary to neurosyphilis; he was treated with intravenous ceftriaxone, resulting in improvement, similar to our case [26].

An intriguing aspect of this case, beyond the patient being immunocompetent, is the extensive involvement of large-, medium-, and small-sized arteries in the head and neck region, as demonstrated by angiographic findings. Such widespread vascular involvement significantly broadens the spectrum of differential diagnoses (Supplementary Table 2) and poses substantial challenges for clinicians. Identifying the underlying condition—neurosyphilis in this case—or even suspecting it as a potential diagnosis was particularly difficult owing to the atypical presentation and extensive vascular changes observed.

Several mechanisms have been proposed to explain the pathogenesis of stroke in syphilitic patients, including vasculitis leading to luminal narrowing or occlusion, endarteritis obliterans, and thrombosis secondary to hypercoagulability. The angiographic findings may show a pattern of vasculitis consistent with both Heubner's arteritis and Nissl–Alzheimer's arteritis. In the case presented here, the patient's ischemic stroke can be attributed to syphilitic vasculitis, emphasizing the importance of considering neurosyphilis in the differential diagnosis of stroke, especially in regions with a high prevalence of syphilis.

Ischemic stroke in young patients presents a complex diagnostic challenge, particularly in the context of rare conditions such as MVS. Careful exclusion of cardioembolic sources, other infectious or inflammatory vasculitis processes with overlapping clinical and radiologic

Table 2 Motor examination at admission (10 September 2023), 30th day post-discharge follow-up (24 October 2023), and fifth month post-discharge follow-up (25 February 2023)

	Tone		Power		
	Upper	**Lower**	**Upper**	**Lower**	
Right	Normotonic	Normotonic	5/5	5/5	
Left	Hypertonic	Hypertonic	0/5	0/5	
Reflex examination at admission					
	Biceps	Triceps	Patella	Ankle	Clonus
Right	+	+	+ +	+ +	
Left	+ + +	+ + +	+ + +	+ + +	Positive
Motor examination after 30 days of followup					
	Tone		Power		
	Upper	Lower	Upper	Lower	
Right	Normotonic	Normotonic	5/5	5/5	
Left	Hypertonic	Hypertonic	2/5	2/5	
Reflex examination 30 days post-discharge					
	Biceps	Triceps	Patella	Ankle	Clonus
Right	+ +	+ +	+ +	+ +	
Left	+ +	+ +	+ +	+ +	Negative
Motor examination after fifth month post-discharge					
	Tone	Power			
	Upper	Lower	Upper	Lower	
Right	Normotonic	Normotonic	5/5	5/5	
Left	Hypertonic	Hypertonic	5/5	5/5	
Reflex examination after fifth month post-discharge					
	Biceps	Triceps	Patella	Ankle	Clonus
Right	+ +	+ +	+ +	+ +	
Left	+ +	+ +	+ +	+ +	Negative

There is comparable muscle bulk during admission and follow-up. After fifth month of follow-up, cerebellar function tests are normal

features, and noninflammatory vasculopathies is critical in young patients with atypical ischemic strokes.

Neurosyphilis and Takayasu arteritis (TAK) can both present with vasculitis but differ in their pathogenesis, clinical features, and diagnostic criteria [29, 30]. Neurosyphilis may manifest as MVS, leading to ischemic events owing to the involvement of small-, medium-, and large-sized vessels, confirmed by positive CSF and serum VDRL tests [29]. In contrast, TAK is chronic vasculitis affecting large arteries, leading to obstructive vascular disease and possible cerebrovascular accidents. Diagnosis of TAK requires characteristic angiographic evidence of vessel stenosis or occlusion in addition to nonspecific systemic symptoms [30, 31]. In the case presented here, while the clinical features and vascular involvement might suggest TAK, the lack of typical angiographic findings and inflammatory markers and the presence of multiple indicators of neurosyphilis makes TAK less likely.

Cardioembolic stroke is often a key differential diagnosis for stroke in young patients. However, in this case, the presence of positive serum and CSF VDRL test results, angiographic evidence of vasculitis, and carotid Doppler findings showing echogenic thickening—combined with normal electrocardiography (ECG) and echocardiography results—strongly argue against a cardioembolic origin. These findings support a vasculitic etiology, with neurosyphilis as the likely underlying cause.

Noninflammatory vasculopathies, such as moyamoya disease and fibromuscular dysplasia, are also differential considerations. Moyamoya disease, for instance, presents with progressive stenosis of intracranial vessels and compensatory collateral circulation, leading to ischemic events [28]. Fibromuscular dysplasia affects predominantly medium and large vessels, producing a "string of beads" appearance on angiography. Unlike meningovascular syphilis, which primarily affects small- and medium-sized vessels and shows evidence of vasculitis in serologic and CSF testing, noninflammatory vasculopathies lack inflammatory markers and systemic symptoms.

Systemic vasculitides, such as granulomatosis with polyangiitis, polyarteritis nodosa, and systemic lupus erythematosus, can lead to ischemic strokes, particularly in young patients. These conditions often present with systemic manifestations, such as skin lesions, renal involvement, and respiratory symptoms, which are typically absent in meningovascular syphilis. Laboratory findings, including autoimmune antibody panels (for example, antinuclear antibodies and anti-neutrophil cytoplasmic antibodies), are helpful in identifying systemic vasculitic disorders. In addition, carotid imaging in MVS often shows distinctive findings such as thickened and echogenic arterial walls rather than the small-vessel pathology seen in systemic vasculitis [38–42].

According to current guidelines, the diagnosis of neurosyphilis is usually made on the basis of clinical history, physical examination findings, syphilis antibody tests including treponemal tests (TTs) and lipoidal (or antiphospholipid) nontreponemal tests (NTTs), CSF analysis, and occasionally, imaging [32, 33]. However, these tests may have limitations, including false-negative results, particularly in cases of early syphilis or in patients with concomitant HIV infection. Therefore, clinicians should maintain a high index of suspicion for neurosyphilis and consider empirical treatment in individuals with compatible clinical features, especially in settings where confirmatory testing may be challenging or unavailable [2, 10].

The management of neurosyphilis typically requires antibiotic therapy with penicillin, which remains the treatment of choice owing to its efficacy and low likelihood of resistance. In cases of neurosyphilis with neurological complications, such as stroke or meningitis, intravenous penicillin G is recommended to achieve adequate CSF penetration. The CDC recommends the use of intravenous or intramuscular ceftriaxone as an alternative treatment for neurosyphilis, though this is based on limited data [32, 34, 35]. The only randomized controlled trial (RCT) included 30 People with HIV/AIDS (PWH) randomized to either 10 days of ceftriaxone 2 g intravenously daily or penicillin G 4 MU intravenously every 4 hours. However, the optimal duration of treatment and the need for adjunctive therapies, such as corticosteroids, remain areas of debate and require further research to inform evidence-based practice [2, 10].

Long-term follow-up is essential in patients with neurosyphilis to monitor treatment response, prevent disease progression, and detect potential treatment complications, such as Jarisch–Herxheimer reaction or treatment failure. Regular clinical and serological assessments are recommended to ensure the effectiveness of antibiotic therapy and to guide the need for retreatment or additional interventions [36]. Repeat CSF testing is not routinely recommended for individuals with appropriate clinical and serological results, unless they are persons with disabilities (PWD) and are on antiretroviral therapy (ART) [32, 37]. Therefore, expectations must be set through the patient's healthcare providers. Treatment of symptoms depends on the anatomical site of the injury, the degree of pathology, and the length of time from the onset of symptoms to the end of treatment.

Regarding prevention, patients with neurosyphilis moreover should be counseled regarding the importance of partner notification, safe sexual practices, and screening for other sexually transmitted infections, including HIV, to prevent further transmission and complications [2, 10].

Conclusion

The case presented underscores the complexities in diagnosing and treating neurosyphilis when it manifests as an ischemic stroke in a young male patient, particularly with no traditional risks for stroke. Clinicians must uphold a heightened suspicion of neurosyphilis, especially in cases with unusual stroke symptoms or unexplained neurological manifestations. A comprehensive approach involving serological testing and neuroimaging studies is crucial for prompt diagnosis and effective management. This emphasizes the importance of early recognition and thorough evaluation to ensure timely intervention and appropriate care for patients with neurosyphilis-related stroke, highlighting the significance of considering this differential diagnosis in young individuals with stroke-like presentations. Further research is needed to elucidate the optimal diagnostic and treatment strategies for neurosyphilis, especially in resource-limited settings, to improve patient outcomes and reduce the burden of this potentially debilitating disease.

Strengths and limitations of this study

- The case report demonstrates a thorough evaluation of the patient, including neuroimaging, cerebrospinal fluid analysis, and angiography.
- The patient's neurological status improved with the implemented treatment regimen.
- The case provides valuable insights into a young patient presenting with stroke-like symptoms and an atypical etiology.
- The absence of serial serological titers and follow-up carotid Doppler restricts the ability to definitively assess disease progression and treatment response.
- MRI plays a pivotal role in the diagnostic process of neurosyphilis. The lack of MRI in our case is an important limitation.
- The study's limitations were influenced by resource availability, which impacted the scope of the follow-up investigations.

Key clinical messages for practicing clinicians

- Neurosyphilis warrants consideration as a potential cause of ischemic stroke in susceptible individuals.
- Neurosyphilis can occur in immunocompetent adults.
- Diagnosis often relies on clinical evidence supported by a high index of suspicion.
- Early initiation of management is crucial to lower the risk of complications associated with neurosyphilis.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13256-025-05090-9.

Supplementary Material 1: Table 1: Summary of Literature Review reveals link between stroke and neurosyphilis over the past decade (2009–2024), 2024.

Supplementary Material 2: Table 2: Summary of differential diagnosis for meningovascular syndrome presenting as ischemic stroke.

Supplementary Material 3. Video 1. Video 1. Axial and coronal view of head and neck CT angiography showing luminal narrowing of the right proximal internal carotid with thickened enhancing wall measuring 3.3 cm in length. There is long-segment occlusion of the right internal carotid artery involving the rest of cervical segment and intracranial segments with thickened enhancing wall, there is no enhancement of right middle cerebral artery; the right anterior cerebral artery gets collateral supply and has luminal enhancement. There is diffuse decreased attenuation of the right cerebral hemisphere with attenuated cortical vessels (if not clearly visible please see supplementary video 1 and 2).

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Author contributions
All the authors were involved in concept design for the manuscript, manuscript preparation, formal analysis, writing—review, and validation, and they were involved in the management of the patient. All are in agreement 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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Data availability
The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
Ethical clearance was obtained from the Institutional Review Board (IRB) of the Institute of Health, Jimma University.

Consent for publication
Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Consent statement
Written informed consent was obtained from the patient before starting the data collection process. The confidentiality and privacy of the patient were assured. Neither the data records nor the extracted data were used for any other purpose.

Competing interests
The authors declare no competing interests.

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