Cureus
Part of SPRINGER NATURE

Open Access Case Report

Suspected Syphilitic Left Main Coronary Ostial Stenosis Evaluated by Intravascular Ultrasound and Directional Coronary Atherectomy: A Case Report

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Review began 09/11/2026
Review ended 10/22/2026
Published 10/24/2026

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DOI: 10.7759/cureus.118493

Abstract

A 49-year-old previously healthy man developed cardiopulmonary arrest during exercise caused by critical isolated left main coronary ostial stenosis. Positive syphilis serology and multimodality imaging suggested nonatherosclerotic vasculopathy. Intravascular ultrasound (IVUS) demonstrated a predominantly fibrous lesion with minimal lipid or calcification. Directional coronary atherectomy (DCA) was performed before stenting to obtain tissue for histopathologic evaluation, which revealed fibrous intimal thickening without features of atherosclerotic plaque. Alternative inflammatory and systemic vasculopathies were excluded. Although definitive histopathologic confirmation of syphilitic arteritis was unavailable, the integrated clinical findings supported this diagnosis and illustrate the value of tissue characterization in atypical coronary lesions.

Categories: Cardiology, Emergency Medicine, Infectious Disease
Keywords: directional coronary atherectomy, extracorporeal life support (ecls), intracoronary imaging, intravascular ultrasound, syphilitic aortitis

Introduction

Cardiovascular syphilis is a rare manifestation of tertiary syphilis that classically involves the ascending aorta, resulting in syphilitic aortitis, aortic aneurysm, aortic regurgitation, or coronary ostial stenosis [1-3]. Obliterative endarteritis of the vasa vasorum can cause medial ischemia, chronic inflammation, and fibrosis; extension of this process to the aortic root may narrow the coronary ostia. Although coronary ostial involvement is a recognized complication, isolated coronary artery disease in the absence of overt aortic pathology is exceptionally uncommon and may be difficult to distinguish from atherosclerotic or other inflammatory coronary diseases [4-6]. Moreover, histopathological confirmation is rarely feasible because coronary tissue is not routinely obtainable during percutaneous coronary intervention.

In this report, we present a case of critical isolated left main coronary ostial stenosis presenting with cardiac arrest in a patient with positive syphilis serology and no evidence of aortic involvement. Intravascular ultrasound (IVUS) demonstrated morphological features atypical for conventional atherosclerosis, and directional coronary atherectomy (DCA) was performed to obtain tissue for histopathological evaluation before stent implantation. This case highlights the diagnostic challenges of suspected syphilitic coronary arteritis and illustrates the potential value of integrating intracoronary imaging with coronary tissue sampling in the evaluation of nonatherosclerotic coronary lesions.

Case Presentation

A 49-year-old previously healthy man developed chest pain while exercising and subsequently suffered cardiopulmonary arrest. Bystander cardiopulmonary resuscitation and an automated external defibrillator shock restored circulation; however, recurrent ventricular fibrillation required extracorporeal membrane oxygenation support. Emergency coronary angiography demonstrated critical (99%) stenosis at the ostium of the left main coronary artery, with no significant disease in the remaining coronary arteries (Figure *1*).

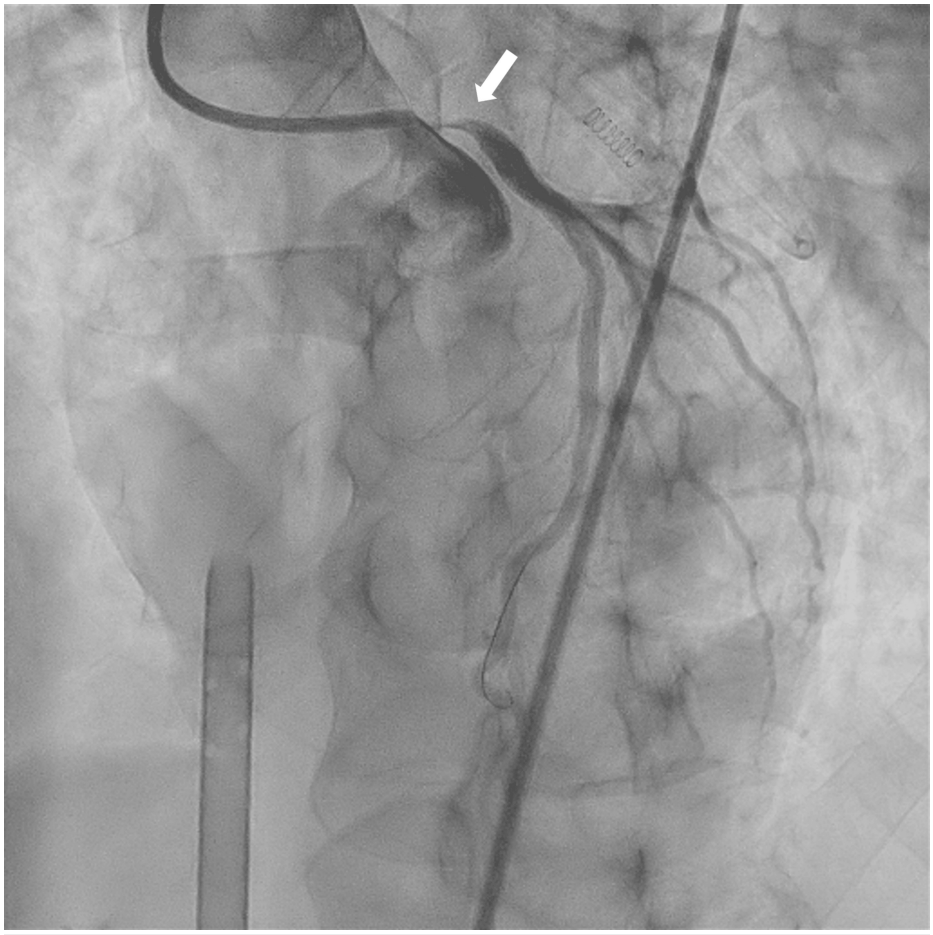


FIGURE 1: Initial coronary angiography

Initial coronary angiography showing severe stenosis of the left main coronary ostium (white arrow).

Serologic testing on admission revealed positive rapid plasma reagin (RPR; 336 R.U.) and *Treponema pallidum* hemagglutination assays, raising suspicion for coronary ostial stenosis associated with syphilitic arteritis. Although positive serological findings alone do not establish a definitive diagnosis of cardiovascular syphilis, the unusual angiographic appearance of isolated left main coronary ostial stenosis prompted consideration of syphilitic vasculopathy as a potential etiology. Alternative diagnoses, including atherosclerotic disease, Takayasu arteritis, IgG4-related disease, fibromuscular dysplasia, congenital coronary abnormalities, and other nonatherosclerotic inflammatory vasculopathies, were also considered (Table *1*).

Potential etiology	Evidence considered	Interpretive limitation
Atherosclerosis	No significant disease elsewhere; fibrous IVUS and DCA tissue without typical lipid-rich plaque	Fibrous atherosclerosis cannot be excluded categorically
Takayasu or other large-vessel arteritis	No overt aortic wall thickening or aneurysm; systemic evaluation unrevealing	Microscopic or limited disease cannot be excluded
IgG4-related disease	Serum IgG4 within reference range; no overt aortic inflammatory changes	Normal IgG4 does not independently exclude disease
Fibromuscular dysplasia	Isolated ostial distribution without reported characteristic arterial changes	No dedicated systemic vascular imaging documented
Congenital/iatrogenic coronary disease	No reported congenital anomaly or preceding coronary instrumentation	Exclusion based on available clinical and angiographic data
Syphilitic vasculopathy	Positive syphilis serology, isolated ostial lesion, atypical tissue morphology	No diagnostic vasa vasorum or full-wall histopathology

TABLE 1: Differential diagnosis of isolated left main coronary ostial stenosis

The table summarizes the principal differential diagnoses considered in this case and the corresponding clinical, laboratory, and imaging findings used to assess each potential etiology.

IVUS, intravascular ultrasound; DCA, directional coronary atherectomy; IgG4, immunoglobulin G4

IVUS performed before intervention demonstrated a predominantly fibrous lesion with minimal lipid or calcification, negative remodeling of the vessel, and partial disruption of the medial layer, findings atypical for conventional atherosclerosis (Figure 2).

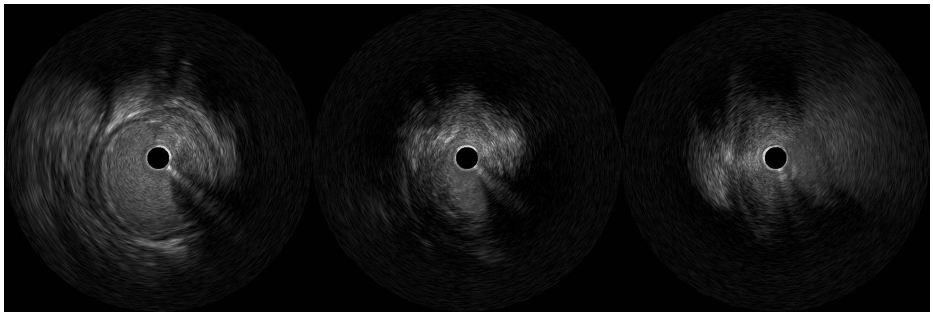


FIGURE 2: Intravascular ultrasound findings

Intravascular ultrasound demonstrating predominantly fibrous plaque with disruption of the medial layer.

Given the atypical clinical presentation, positive syphilis serology, and the potential diagnostic value of tissue characterization, DCA (DCA MK2, Nipro, Osaka, Japan) was performed to obtain tissue samples from the lesion prior to definitive treatment. The primary purpose of DCA was tissue acquisition rather than plaque debulking. The procedure was performed under continuous venoarterial extracorporeal membrane oxygenation (VA-ECMO) support and IVUS guidance to minimize procedural risk and optimize device positioning. Histopathological examination of the retrieved specimen demonstrated fibrous intimal thickening without cholesterol deposition or features of typical atherosclerotic plaque (Figure 3). However, the specimen was limited to the intimal lesion and did not include the full vessel wall or vasa vasorum; therefore, characteristic histopathological findings of syphilitic vasculitis, such as obliterative endarteritis of the vasa vasorum, could not be evaluated. Following tissue sampling, a drug-eluting stent (Xience Skypoint 4.0 × 12 mm, Abbott Vascular, Santa Clara, CA, USA) was successfully implanted in the left main trunk with good angiographic results (Figure 4).

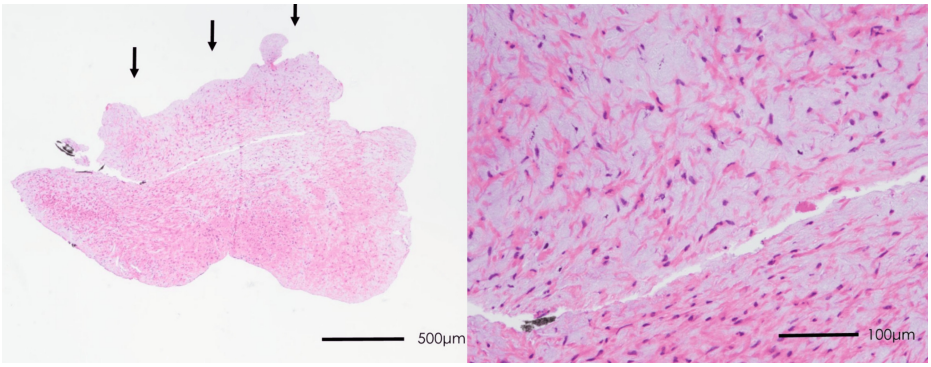


FIGURE 3: Histopathological findings

Histopathological examination demonstrating fibrous intimal thickening without cholesterol deposition (black arrows), consistent with a non-atherosclerotic lesion (hematoxylin-eosin staining).

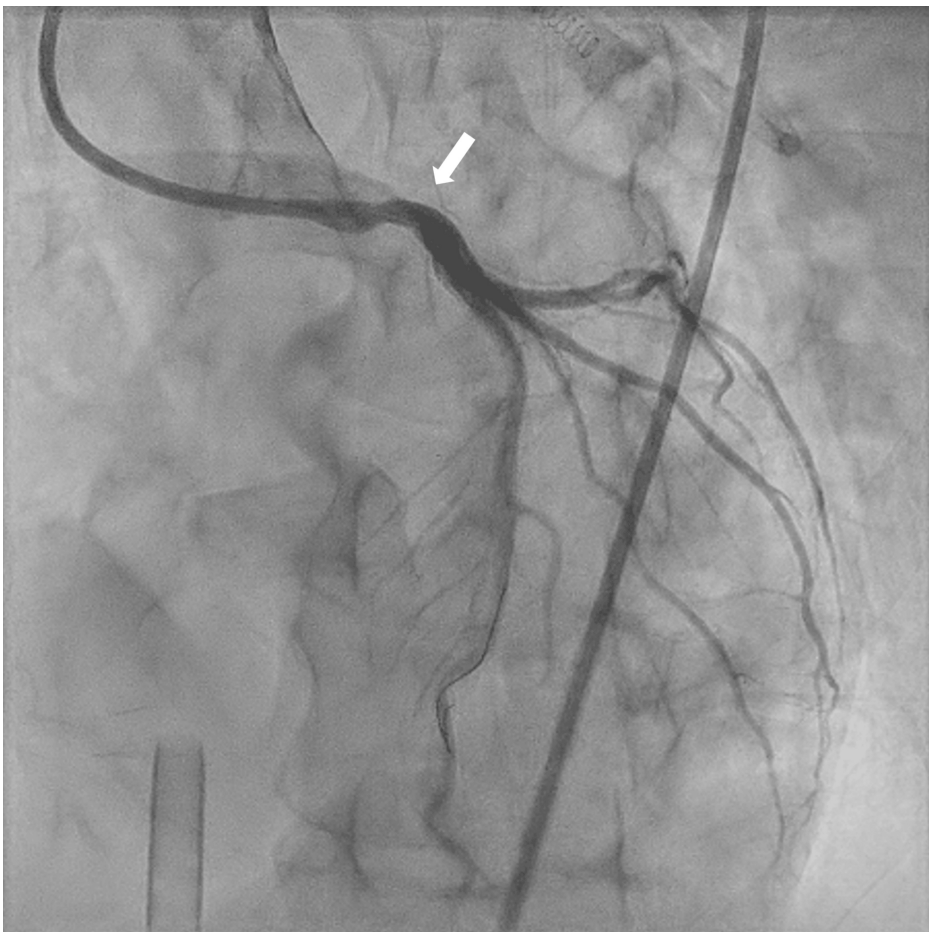


FIGURE 4: Coronary angiography post-stenting

Coronary angiography after stent implantation showing successful treatment of the left main coronary ostial stenosis (white arrow).

Computed tomography performed during hospitalization revealed no evidence of aortic aneurysm or overt aortitis, and transthoracic echocardiography showed no aortic regurgitation (Figure *5*). Serum IgG4 levels were within the normal range, HIV testing was negative, and serological testing for large-vessel vasculitis and other systemic inflammatory vasculopathies was unrevealing. Furthermore, there was no evidence of aortic wall thickening, aneurysmal change, or other imaging findings suggestive of advanced cardiovascular syphilis or large-vessel vasculitis. These findings were useful in excluding overt ascending aortic involvement and influenced our interpretation that this case may represent a localized coronary

manifestation or an early stage of cardiovascular syphilis rather than classical syphilitic aortitis. The patient recovered without neurological sequelae. He received intramuscular benzathine penicillin G once weekly for three consecutive weeks. At six months, RPR had decreased to 97 R.U.



FIGURE 5: Computed tomography findings

White arrows identify the assessed aortic region; they do not denote pathology. No overt wall thickening or aneurysmal change is evident.

Discussion

Cardiovascular syphilis is a late manifestation of *T. pallidum* infection that classically affects the ascending aorta and may result in aortitis, aortic aneurysm, aortic regurgitation, and coronary ostial stenosis [1-3]. The underlying pathological process is traditionally attributed to obliterative endarteritis of the vasa vasorum, leading to ischemic injury of the aortic media, chronic inflammation, and subsequent fibrosis. When this inflammatory and fibrotic process involves the aortic root, extension to the coronary ostia may produce clinically significant coronary stenosis. Nevertheless, coronary ostial stenosis attributable to syphilis has become exceedingly uncommon in the modern antibiotic era, and isolated coronary involvement without radiological or echocardiographic evidence of aortic disease is particularly rare [4-6]. In the present case, however, the lesion was restricted to the left main ostium, and conventional imaging showed no aortic wall thickening, aneurysm, or aortic regurgitation. This pattern raises the possibility of limited or clinically occult aortic-root involvement; it does not establish a distinct coronary-limited pathobiology or the disease's temporal sequence.

Several features of the present case raised suspicion for a nonatherosclerotic etiology. The patient was relatively young and previously healthy, and coronary angiography demonstrated severe, highly localized stenosis confined to the left main coronary ostium, with no significant atherosclerotic disease elsewhere in the coronary circulation. This anatomical pattern is unusual for conventional coronary atherosclerosis and should prompt consideration of alternative etiologies, including inflammatory aortitis, congenital

abnormalities, fibromuscular dysplasia, iatrogenic injury, and infectious vasculopathy. In the present patient, positive serological tests for syphilis provided an important etiological clue. Moreover, investigations for other systemic inflammatory or infiltrative disorders, including Takayasu arteritis and IgG4-related disease, were unrevealing. Taken together, these findings supported syphilitic coronary arteritis as the most plausible explanation for the lesion.

Importantly, the absence of overt aortic involvement does not necessarily exclude cardiovascular syphilis. Classical syphilitic coronary ostial stenosis is generally considered a consequence of syphilitic aortitis involving the aortic root [2,3]. In our patient, however, computed tomography demonstrated neither aortic wall thickening nor aneurysmal change, and echocardiography showed no aortic regurgitation. These findings raise the possibility that coronary ostial involvement may occasionally occur as a localized manifestation of syphilitic vasculopathy or may precede the development of clinically apparent aortic disease. Alternatively, subtle microscopic aortic inflammation may have been present despite the absence of macroscopic abnormalities on contemporary imaging. Therefore, the present case expands the phenotypic spectrum of suspected cardiovascular syphilis and underscores that the diagnosis should not be dismissed solely because classical manifestations of syphilitic aortitis are absent.

Intravascular imaging provided additional insight into the underlying lesion morphology [7,8]. IVUS demonstrated predominantly fibrous tissue with minimal lipid accumulation or calcification, negative remodeling, and focal disruption of the medial layer. These findings differed substantially from the lipid-rich or calcified plaque morphology commonly encountered in atherosclerotic left main disease. Although IVUS findings are not specific for syphilitic arteritis and cannot independently establish its etiology, the discordance between the severe angiographic stenosis and the absence of typical atherosclerotic plaque characteristics further strengthened the suspicion of a nonatherosclerotic process. In this context, intravascular imaging was valuable not only for procedural planning but also for refining the differential diagnosis.

A distinctive aspect of this case was the use of DCA to obtain tissue for histopathological examination. DCA is principally used as a therapeutic strategy for selected coronary lesions; however, its ability to retrieve relatively large, architecturally preserved tissue specimens also provides a unique opportunity to characterize coronary disease in vivo [8-10]. Histological examination in the present case demonstrated prominent fibrous intimal thickening without cholesterol deposition or other typical features of atherosclerotic plaque, supporting the interpretation suggested by IVUS. Thus, the concordance between intravascular imaging and histopathology provided complementary evidence against conventional atherosclerosis. Nevertheless, an important diagnostic limitation must be acknowledged. The DCA specimen predominantly represented the intimal component of the lesion and did not contain the full thickness of the arterial wall or the vasa vasorum. Consequently, characteristic pathological features of cardiovascular syphilis, particularly obliterative endarteritis of the vasa vasorum and plasma cell-predominant inflammation involving the media and adventitia, could not be directly assessed. Positive syphilis serology, moreover, establishes exposure to *T. pallidum* but does not by itself demonstrate that the coronary lesion is caused by syphilitic arteritis. Accordingly, this case should be regarded as presumed, rather than histologically proven, syphilitic coronary arteritis. This distinction is particularly important because attributing an unusual coronary lesion to syphilis solely on the basis of positive serology could result in diagnostic overinterpretation.

Immediate revascularization was warranted by the life-threatening presentation and critical left main obstruction. VA-ECMO provided circulatory support while IVUS-guided tissue acquisition and stent implantation were performed. This case should not be taken to suggest routine DCA sampling in unstable coronary lesions: the risks and potential diagnostic yield require individualized assessment. Its principal contribution is methodological, illustrating how imaging and selectively obtained tissue can refine, but not definitively resolve, the differential diagnosis of atypical coronary ostial stenosis. Future clinical assessment should include appropriate serologic follow-up and surveillance for delayed aortic manifestations.

Conclusions

This case describes critical isolated left main coronary ostial stenosis associated with positive syphilis serology and atypical, predominantly fibrous lesion morphology. IVUS-guided DCA enabled histological evaluation and strengthened suspicion of a nonatherosclerotic process. However, the intimal specimen did not contain the vasa vasorum, and syphilitic arteritis remained a presumptive rather than histologically proven diagnosis. Selective integration of intravascular imaging and tissue sampling may assist the assessment of unusual coronary lesions without replacing careful clinicopathological interpretation.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Takumi Toya, Yoshichika Miyazaki

Acquisition, analysis, or interpretation of data: Takumi Toya, Takafumi Nishimura, Masayuki Aoyama, Munehisa Sakamoto

Drafting of the manuscript: Takumi Toya, Yoshichika Miyazaki

Supervision: Takumi Toya

Critical review of the manuscript for important intellectual content: Takafumi Nishimura, Masayuki Aoyama, Munehisa Sakamoto

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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