

Insight into the Role of Optical Coherence Tomography in Acute Coronary Syndrome following Scrub Typhus: A Case Report

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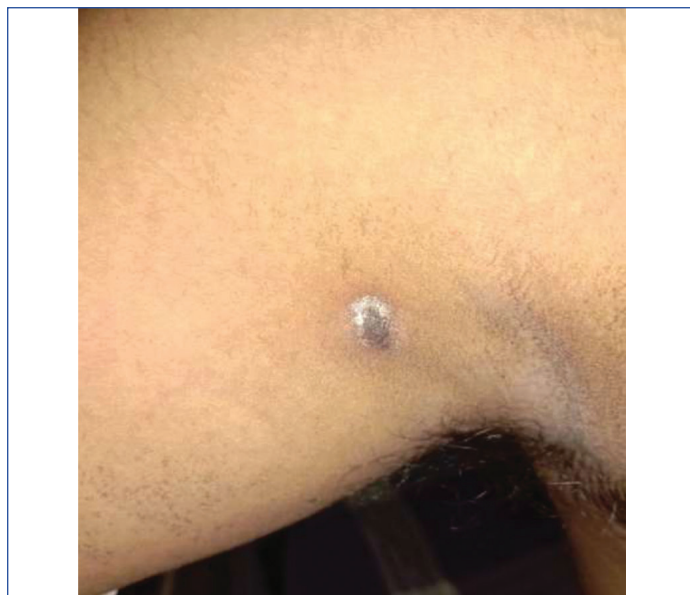
ABSTRACT

Scrub typhus, an illness stemming from the *Orientia tsutsugamushi* bacterium within the Rickettsiaceae family, is recognised for its febrile nature and frequently linked to vasculitis-induced complications. The challenges faced in the management of scrub typhus complicated by Acute Coronary Syndrome (ACS) and Multiple Organ Dysfunction Syndrome (MODS) is presented in this case report. Of particular significance, this report introduces a novel approach of employing Optical Coherence Tomography (OCT) to identify the underlying pathology, which guided us in making the treatment decision—a novel application of OCT in infectious disease management yet to be documented in the existing medical literature. In present case, OCT was used and the lesion was characterised to be vasculitic and not atherosclerotic, thereby changing the entire treatment course, benefiting the patient. This innovative utilisation of OCT throws light over vasculitic pathology of present case and emphasises the need for intracoronary imaging in the management of this rare complication of a fairly common tropical disease.

Keywords: Acute coronary syndrome, Interventional cardiology, Vasculitis

CASE REPORT

Upon arrival at the emergency department, a 60-year-old previously healthy woman with no co-morbidities presented with a one-week history of fever and vomiting. She was treated symptomatically by her family physician with paracetamol for fever. She was a homemaker engaged in backyard farming, and she denied any recent travel history. Upon admission, the patient was alert but mildly dehydrated, and her physical examination revealed an eschar on the right armpit [Table/Fig-1].

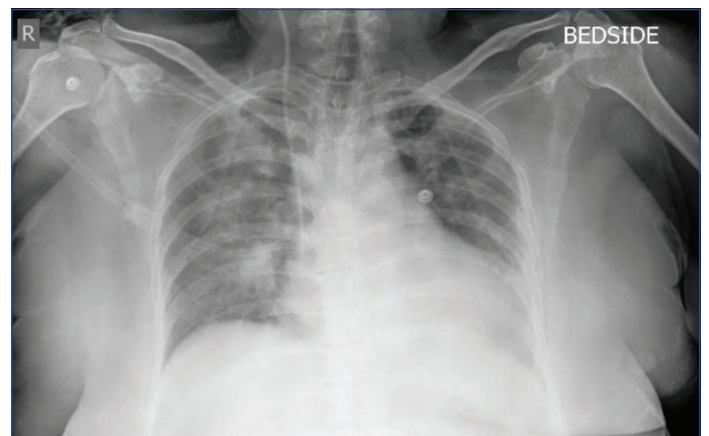


[Table/Fig-1]: Eschar noted over right axilla.

Initial vitals recorded upon arrival were a body temperature of 39.1°C, blood pressure of 100/70 mmHg, a pulse rate of 102 beats per minute, and an oxygen saturation of 96% on room air. Initial tests revealed a normal chest radiograph and arterial blood gas analysis indicating a pH of 7.44, PaCO₂ at 34.2 mmHg, PaO₂ at 46.1 mmHg, and HCO₃⁻ at 22.9 mmol/L. Laboratory findings indicated a haemoglobin level of 12 g/dL, haematocrit of 37%, a white blood cell count of 10,260/μL, and a platelet count of 128,000/μL. Her

serum blood urea nitrogen and creatinine levels were 30 and 1.7 mg/dL, respectively. Additional tests revealed normal to slightly elevated liver function markers, glucose at 103 mg/dL, C-Reactive Protein at 63.8 mg/dL, activated partial thromboplastin time at 29.5 seconds, and prothrombin time at 16 seconds. Serological reports confirmed Scrub typhus with IgM Antibody levels at 63.5 Units, leading to the initiation of intravenous Doxycycline and empirical intravenous Augmentin for suspected co-infection.

By the third day of admission, the patient experienced a drop in platelet counts to 85,000/μL while the total leukocyte count increased to 31,050/μL. Her condition deteriorated, leading to drowsiness, and her blood pressure dropped to 80/60 mmHg. An arterial blood gas taken on room air showed pH 7.258, pO₂ 58.1 mmHg, HCO₃⁻ 16 mmol/L, and Lactate 2.6 mmol/L. Chest X-ray revealed bilateral fluffy lung opacities suggestive of Acute Respiratory Distress Syndrome (ARDS) [Table/Fig-2]. Consequently, the patient received non invasive ventilatory support and i.v. noradrenaline.

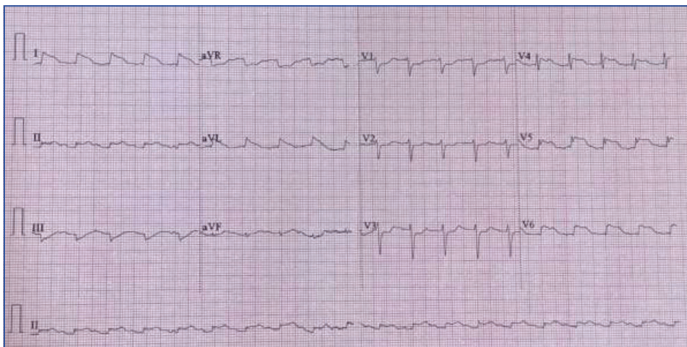


[Table/Fig-2]: Chest X-ray showing ARDS.

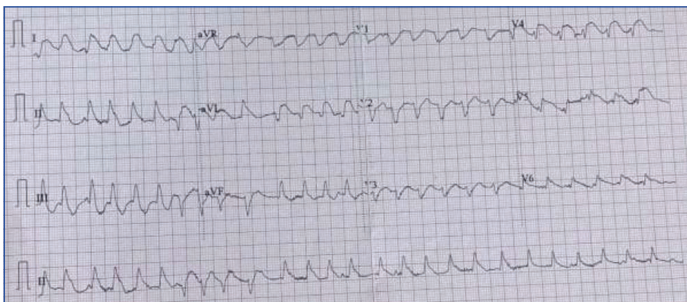
The diagnosis was revealed to be Scrub typhus causing septic shock with Multiple Organ Dysfunction Syndrome (MODS), moderate ARDS, and Acute Kidney Injury (AKI).

Subsequently, on Day 4 of admission, the patient developed chest pain, and an ECG taken showed acute anterolateral wall

myocardial infarction, prompting treatment with streptokinase [Table/Fig-3]. She developed ventricular tachycardia postlysis necessitating a DC cardioversion of 200J, following which sinus rhythm was restored [Table/Fig-4]. Post-treatment, the patient's condition gradually improved.

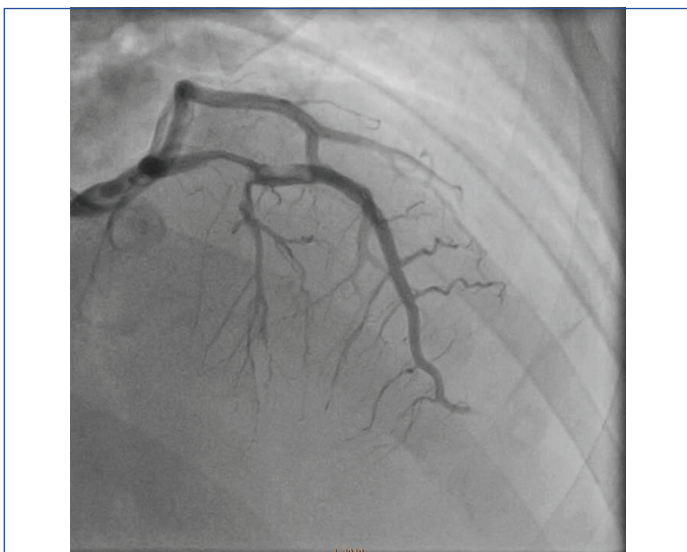


[Table/Fig-3]: ECG taken on day 4 showing ST elevation in anterolateral leads.



[Table/Fig-4]: ECG taken postlysis showing ventricular tachycardia.

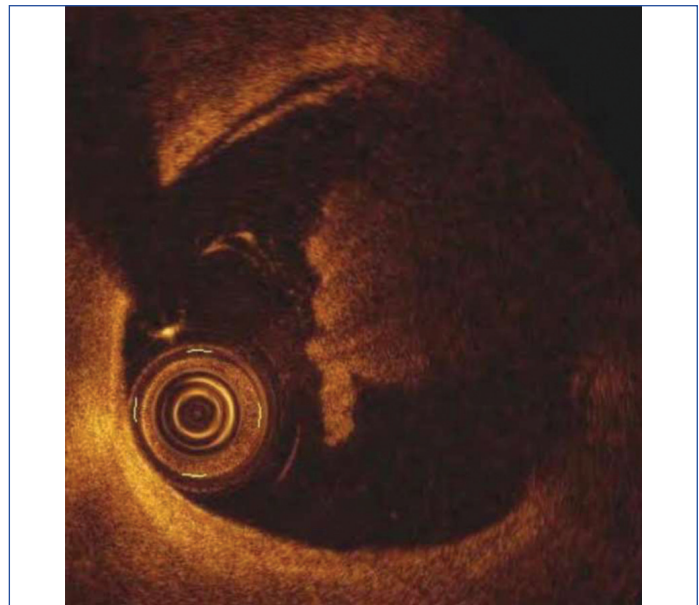
A subsequent coronary angiogram displayed a mid-Left Anterior Descending artery (LAD) lesion with distal TIMI II flow [Table/Fig-5]. Further examination by OCT revealed specks of thrombosis without atherosclerotic plaque, leading to conservative management without stenting [Table/Fig-6]. The patient was treated with a short course of NOAC (rivaroxaban), a single antiplatelet, and statin therapy. The timeline of the entire course of events is summarised in [Table/Fig-7]. During medical follow-up, the patient did not have any angina, with subsequent Electrocardiograms (ECGs) exhibiting normal results [Table/Fig-8].



[Table/Fig-5]: Coronary angiogram showing mid LAD lesion.

DISCUSSION

Scrub typhus, recognised for its notable morbidity and mortality, presents a complex pathological profile rooted in the intricate manifestations of *Orientia tsutsugamushi* infection, which is a gram negative obligate intracellular bacterium in the genus *Rickettsia*. This zoonotic disease primarily thrives in the chigger, the larval form

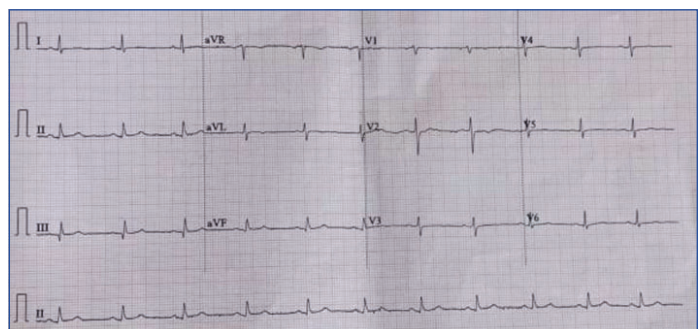


[Table/Fig-6]: OCT image showing specks of thrombus within the vessel.

Day of admission	Event
Day 1	Admitted to hospital, diagnosis suspected and treatment initiated
Day 2	Diagnosis confirmed
Day 3	Development of ARDS, AKI, Septic shock
Day 4	Development of myocardial infarction, lysed with STK, developed VT and reverted with DC shock
Day 6	Underwent coronary angiogram and OCT after stabilisation
Day 10	Discharged home

[Table/Fig-7]: Timeline of events.

ARDS: Acute respiratory distress syndrome; AKI: Acute kidney injury; STK: Streptokinase; VT: Ventricular tachycardia; DC: Direct current cardioversion OCT: Optical coherence tomography



[Table/Fig-8]: ECG taken on follow-up visit.

of the trombiculid mite, with humans being inadvertently infected. Transmission occurs in habitats with long grass and dirt-floor homes, predominantly within the "tsutsugamushi triangle," covering regions across northern and eastern Asia, western Pacific islands, and parts of northern Australia [1,2].

The pathophysiology involves the proliferation of *Orientia tsutsugamushi* within human small vessel endothelial cells, resulting in systemic vasculitis and perivasculitis, contributing to increased vascular permeability and tissue hypoperfusion [2]. Consequently, scrub typhus can present as a non specific febrile illness or lead to severe multiorgan dysfunction, including AKI, ARDS, myocarditis, hepatitis, and meningoencephalitis. While the majority of cases respond well to antibiotic treatment, particularly with tetracyclines, a subset of cases may encounter serious complications. The mortality rate in severe cases or those with improper treatment is reported to be as high as 30% [3]. Although myocardial injury, myocarditis, and left ventricular systolic dysfunction are frequently recognised and associated with increased morbidity but not mortality [4], myocardial infarction as a part of MODS in scrub typhus infection

is rare and reported in a few literatures [5-7]. Although there was a case report of Percutaneous Coronary Intervention (PCI) done for a case of myocardial infarction following scrub typhus infection, the lesion type was not evaluated [6].

Cardiovascular OCT is a catheter-based invasive intracoronary imaging system that can accurately assess the composition of the coronary arterial wall and determine the characteristics of atherosclerotic lesions. Using light rather than ultrasound, OCT produces high-resolution in-vivo images of coronary arteries and deployed stents. OCT can provide detailed information on PCI such as dissection, tissue prolapse, thrombus, stent malapposition, and under expansion, thus improving the treatment outcome in patients with coronary artery disease. It helps in the diagnostic assessment of coronary atherosclerosis by characterising the plaque morphology, identifying inflammation, calcium nodules, and thrombus [8].

Compared with Intravascular Ultrasound (IVUS), OCT is superior in recognising all types of thrombus and may also clearly distinguish between red and white thrombi in the lesion. The red thrombus has a strong backscatter and appears as a radially shaded area with a high signal on the surface and low or no signal posteriorly, while white thrombus has low backscatter and appears as a homogeneous region of high or normal signal with an irregular shape [9]. OCT is increasingly being used to guide complex coronary interventions such as bifurcation lesions, Chronic Total Occlusion (CTO), Left Main Coronary Artery (LMCA) disease, and as an aid to calcium-modifying devices [8,10]. Although OCT has found its place in the armamentarium of cardiologists, its use in infectious disease-related myocardial infarction is not yet reported in the literature.

In the case report described here, the application of OCT was instrumental in assessing the vascular involvement in scrub typhus. Conventional coronary angiography only demonstrated the lesion and its severity without characterising it, which may have led to inadvertent placement of an intracoronary stent with following prolonged dual antiplatelet therapy. Using OCT in present case allowed us to visualise specks of thrombosis without evident atherosclerotic plaque within the affected vessel. This observation led to the decision for conservative management without stenting, which otherwise would have led to unwarranted long-term dual antiplatelet therapy. This highlights the potential utility of OCT in such infectious vasculitic conditions for precise diagnostic and therapeutic considerations. In present case OCT was used and characterised the lesion to be vasculitic and not atherosclerotic, thereby changing the entire treatment course benefiting the patient. Without the usage of OCT, the patient would have been managed conventionally with intracoronary stent placement and rather unwarranted prolonged dual antiplatelet therapy.

Additionally, the significance of early recognition and prompt intervention in severe cases of scrub typhus to mitigate its potentially fatal complications becomes evident from the detailed clinical course outlined in the case study. This underscores the importance of a multidisciplinary approach, including the use of advanced imaging modalities like OCT, to better understand and manage the complex pathophysiology of scrub typhus-induced vasculitis and associated multiorgan dysfunction.

CONCLUSION(S)

Our case highlights the need to be aware of potentially lethal but treatable complications of scrub typhus-mediated vasculitis. Even though the pathogenesis of scrub vasculitis was hypothesised, through this case report, we confirmed the same through intracoronary imaging. Conventional coronary angiography demonstrates only the lesion and its severity without characterising it, which may lead to inadvertent placement of an intracoronary stent with following dual antiplatelet therapy. By demonstrating thrombus without underlying atherosclerosis by OCT in our case, we avoided stenting and conservatively managed the patient without any undue complications on long-term follow-up. With our case report, we have highlighted that vasculitis, not atherosclerosis, is the cause of scrub typhus-related myocardial infarction, thereby questioning the need for PCI in such cases.

REFERENCES

- [1] Kelly DJ, Fuerst PA, Ching WM, Richards AL. Scrub typhus: The geographic distribution of phenotypic and genotypic variants of *Orientia tsutsugamushi*. Clin Infect Dis. 2009;48(Suppl_3):S203-30.
- [2] Dogra S. Recent advances in understanding pathophysiology of scrub typhus. JK Science. 2010;12(2):70-71.
- [3] Griffith M, Peter JV, Karthik G, Ramakrishna K, Prakash JA, Kalki RC, et al. Profile of organ dysfunction and predictors of mortality in severe scrub typhus infection requiring intensive care admission. Indian J Crit Care Med. 2014;18(8):497-502.
- [4] Dhiman P, Sharma A, Raina R, Madabhavi IV. Scrub typhus presenting as acute myocardial infarction. Online J Health Allied Sci. 2012;11(3).
- [5] Chen Y, Guo Z, Wang L, Cheng N, Wang C. The first case report of acute myocardial infarction in young adult caused by scrub typhus. Medicine. 2023;102(39):e35271.
- [6] Kim DG, Kim JW, Choi YS, Kim SH, Kim SM, Park CG, et al. Acute myocardial infarction following scrub typhus infection. Int J Cardiol. 2007;114(1):E18-20.
- [7] Pradeesh A, Vasudevan B, Sharma N, Verma R. A rare case of scrub typhus vasculitis presenting as acute coronary syndrome diagnosed by skin manifestations. Indian J Dermatol Venereol Leprol. 2022;88(2):184-87.
- [8] Maddali VR, Koganti S. Role of optical coherence tomography in coronary interventions. Indian Journal of Clinical Cardiology. 2024;26324636231224598.
- [9] Wang J, Yuan S, Qi J, Zhang Q, Ji Z. Advantages and prospects of optical coherence tomography in interventional therapy of coronary heart disease (Review). Exp Ther Med. 2022;23(4):255.
- [10] Bezerra HG, Costa MA, Guagliumi G, Rollins AM, Simon DI. Intracoronary optical coherence tomography: A comprehensive review. JACC: Cardiovasc Interv. 2009;2(11):1035-46.

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