RESEARCH PAPER

Scrub Typhus Presenting as Cardiogenic Shock with Reversible Myocarditis and Serological Cross-Reactivity with Leptospirosis: A Case Report

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ABSTRACT

Scrub typhus is an important cause of acute febrile illness in tropical regions and may present with severe complications including myocarditis, acute respiratory distress syndrome, and multiorgan dysfunction. Cardiac involvement can manifest as heart failure and cardiogenic shock. Another diagnostic challenge in endemic regions is serological cross-reactivity between scrub typhus and leptospirosis when IgM ELISA is used.[1–3]

We report a case of a 47-year-old male presenting with undifferentiated febrile illness and shock. Initial evaluation revealed severe left ventricular systolic dysfunction with global hypokinesia on echocardiography suggestive of myocarditis. While supportive therapy and steroids were initiated for suspected inflammatory myocarditis, further evaluation for febrile illness revealed scrub typhus IgM positivity, following which doxycycline therapy was initiated on the day of admission (sixth day of illness). The patient subsequently showed rapid clinical improvement with recovery of left ventricular function from 26% to 44% within one week.

This case highlights the importance of considering scrub typhus as a reversible cause of myocarditis and shock in endemic regions.[4–6]

Keywords: Scrub typhus, Myocarditis, Cardiogenic shock, Leptospirosis, Serological cross-reactivity, Doxycycline.

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Introduction

Scrub typhus is a zoonotic infection caused by *Orientia tsutsugamushi*, an obligate intracellular bacterium transmitted to humans through the bite of infected larval trombiculid mites (chiggers). The disease is endemic within the "tsutsugamushi triangle," which includes India, Southeast Asia, and parts of the western Pacific region.[7] Scrub typhus is increasingly recognized as a major cause of acute undifferentiated febrile illness in India.[8]

The infection typically presents with fever, headache, myalgia, and lymphadenopathy and may be associated

with a characteristic eschar at the site of mite bite.[9] In severe cases, systemic vasculitis caused by endothelial infection may lead to multiorgan involvement including hepatitis, pneumonitis, acute kidney injury, thrombocytopenia, and myocarditis.[10–12]

Cardiac complications of scrub typhus are increasingly reported and may include myocarditis, arrhythmias, pericardial effusion, and acute heart failure.[13] Myocardial injury occurs due to inflammatory infiltration and endothelial damage leading to impaired myocardial contractility.[14] Recognition of cardiac involvement is important as it may lead to hemodynamic instability and cardiogenic shock.

Another diagnostic challenge in endemic regions is serological cross-reactivity between scrub typhus and leptospirosis when IgM ELISA is used, resulting in potential diagnostic confusion.[15–17]

Case Presentation

A 47-year-old male painter from Medavakkam, Chennai presented to the emergency department on 3 July 2025 with complaints of fever, reduced responsiveness, and abdominal pain for six days. The illness was associated with vomiting for three days and breathlessness for one day. On the day of admission, he also developed chest pain. He was a known case of type 2 diabetes mellitus but was not on regular treatment and had a history of smoking.

On physical examination, a black eschar was noted over the anterior abdominal wall (Figure 1), raising suspicion of a rickettsial infection. At presentation the patient was in shock with a pulse rate of 120 beats per minute and blood pressure of 70/50 mmHg. Oxygen saturation was 96% on room air. Due to persistent hypotension, the patient was initiated on noradrenaline infusion and admitted to the intensive care unit for further management.

Laboratory investigations revealed leukocytosis and severe thrombocytopenia with platelet counts of 31,000/mm³. Liver function tests demonstrated hyperbilirubinemia with total bilirubin of 3.1 mg/dL and elevated transaminases with AST 232 IU/L. Renal function parameters were within normal limits. Electrolyte analysis showed significant hypokalemia (serum potassium 2.5 mmol/L), which was corrected with intravenous potassium supplementation.

In view of fever with no obvious focus of infection, the patient was evaluated for acute undifferentiated febrile illness including tropical infections.

Because of persistent tachycardia and hemodynamic instability, a cardiac evaluation was performed. Electrocardiography showed sinus tachycardia with T-wave inversions in leads V3–V6 and leads I and aVL, along with ST depression in leads V4–V6. Cardiac biomarkers were elevated with Troponin-I at 0.49 ng/mL, suggesting myocardial injury.

2D echocardiography performed on admission revealed mild left ventricular dilatation with global hypokinesia and severe left ventricular systolic dysfunction, with a left ventricular ejection fraction of 26% and grade II diastolic dysfunction. Importantly, no regional wall motion abnormalities were identified, which favored myocarditis rather than acute coronary syndrome.

In view of shock with severe myocardial dysfunction, the patient was initially managed as probable inflammatory myocarditis with cardiogenic shock. Intravenous hydrocortisone therapy was initiated with 100 mg followed by 50 mg every six hours, along with vasopressor support.

Meanwhile, a comprehensive evaluation for tropical febrile illnesses was undertaken. Serological testing revealed scrub typhus IgM strongly positive (98.99). Leptospira IgM ELISA was also positive, while dengue serology and malaria smear were negative. Considering the presence of eschar and the epidemiological prevalence of scrub typhus in the region, the leptospira IgM positivity was interpreted as likely serological cross-reactivity rather than true coinfection.

Based on these findings, doxycycline therapy (100 mg twice daily) was initiated on the day of admission (sixth day of illness). Following initiation of doxycycline therapy, the patient showed progressive clinical and hemodynamic improvement.

As myocardial function improved, noradrenaline infusion was gradually tapered and subsequently discontinued. Steroid therapy was continued for five days and then tapered as the patient stabilized.

A repeat 2D echocardiography performed on 7 July 2025 demonstrated marked improvement in cardiac function with normalization of left ventricular size and improvement of left ventricular ejection fraction to 44%, with only mild global hypokinesia and grade I diastolic dysfunction.

Laboratory parameters also improved during hospitalization, with platelet counts increasing from 31,000/mm³ to 64,000/mm³, along with improvement in liver enzyme levels and normalization of electrolyte abnormalities.

After completion of antibiotic therapy and stabilization of clinical parameters, the patient was discharged on 15 July 2025 in stable condition with advice for cardiology follow-up and repeat echocardiographic evaluation.

Discussion

Scrub typhus has emerged as an important cause of acute undifferentiated febrile illness in India and other parts of Asia.[18] The organism causes widespread vasculitis involving small blood vessels, which may result in multiorgan involvement including hepatic, pulmonary, renal, and cardiac manifestations.[19] Cardiac involvement in scrub typhus is increasingly recognized and may manifest as myocarditis, arrhythmias, and acute heart failure.[20–22]

The pathophysiology of scrub typhus myocarditis involves endothelial injury and inflammatory infiltration of myocardial tissue leading to myocardial dysfunction.[23] Echocardiographic findings typically demonstrate global hypokinesia and reduced ejection fraction, which helps distinguish myocarditis from myocardial infarction where regional wall motion abnormalities are more commonly seen.[24]

Another important issue highlighted in this case is serological cross-reactivity between scrub typhus and leptospirosis. IgM ELISA assays are widely used in endemic regions; however, cross-reactivity may occur due to antigenic similarities and nonspecific antibody responses.[25–27] Antibodies produced during acute rickettsial infections may react with antigens used in leptospira serological assays, leading to false-positive results.[28,29] This may lead to diagnostic confusion, particularly in tropical regions where both infections are prevalent.[30,31]

Myocardial involvement in scrub typhus may occur due to a combination of direct endothelial injury and immune-mediated inflammatory mechanisms. Cytokine release and immune activation may contribute to myocardial inflammation and transient myocardial dysfunction.[32] Some reports suggest that hypersensitivity or immune-mediated injury may also contribute to myocardial damage in rickettsial infections.[33] The rapid improvement in left ventricular function observed in our patient following initiation of doxycycline therapy supports the concept of reversible inflammatory myocarditis.

The role of corticosteroids in infectious myocarditis remains controversial; however, steroids may be beneficial in selected cases where there is significant inflammatory myocardial injury contributing to hemodynamic instability.[34] In our patient, intravenous hydrocortisone was administered due to severe cardiogenic shock with suspected inflammatory myocarditis. The combined effect of antimicrobial therapy and modulation of inflammatory response may have contributed to the rapid recovery of myocardial function.

Early recognition and treatment of scrub typhus are crucial because delayed therapy may lead to severe complications including shock and multiorgan failure.[18,19] Doxycycline remains the treatment of choice and is associated with rapid clinical improvement when initiated early.[29]

A limitation of this case is that the microscopic agglutination test (MAT), which is considered the gold standard for leptospirosis diagnosis, was not performed to definitively exclude leptospiral infection.[35] Additionally, intravenous immunoglobulin (IVIG), which may be considered in severe immune-mediated myocarditis, was not administered as the patient showed rapid clinical improvement with antibiotic therapy and supportive management.[36]

Conclusion

Scrub typhus should be considered in patients presenting with undifferentiated febrile illness and shock in endemic regions, particularly when an eschar is present. Myocarditis is an important but reversible complication that may lead to severe left ventricular dysfunction and cardiogenic shock. Echocardiography plays a key role in diagnosis and monitoring recovery. Clinicians should also be aware of the possibility of serological cross-reactivity between scrub typhus and leptospirosis when interpreting IgM ELISA results. Early recognition and prompt initiation of doxycycline therapy can result in rapid recovery and reversal of myocardial dysfunction.

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Figure 1 - Eschar over anterior abdominal wall

Investigations

Investigation	**Result**
Hemoglobin (Hb)	13.0 g/dL
Total Leukocyte Count (TC)	12,900 /mm³
Platelet Count (PLT)	31,000 /mm³
ESR	10 mm/hr
HbA1c	9.2 %
Urea	17 mg/dL
Creatinine	0.38 mg/dL
Sodium (Na^+)	132 mmol/L
Potassium (K^+)	2.5 mmol/L
Chloride (Cl^-)	99 mmol/L
Total Bilirubin	3.1 mg/dL
Direct Bilirubin	2.1 mg/dL
AST (SGOT)	232 IU/L
ALT (SGPT)	59 IU/L
ALP	147 IU/L
GGT	151 IU/L

INR	1.2

Investigation	**Result**
Troponin I	0.49 ng/mL
Scrub Typhus IgM	Positive (98.99)
Scrub Typhus IgG	Negative
Leptospira IgM	Positive
Leptospira IgG	Negative
Dengue Serology	Negative
Blood Culture	No growth
Urine Culture	Normal urethral flora
MRI Brain	No significant abnormality
Ultrasound Abdomen	Fatty liver (Grade I)