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CASE REPORT

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Diagnosis of pulmonary lophomoniasis infection in patient with systemic lupus erythematosus; A case report and literature review

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Abstract

Over the past 30 years, there has been an increasing number of documented human infections associated with the protozoan Lophomonas, specifically *Lophomonas blattarum*, which is considered a relatively rare infection. These infections are primarily associated with states of immune suppression, including those resulting from corticosteroid therapy. We report a 61-year-old female patient with a 20-year medical history of Systemic lupus erythematosus (SLE) who was admitted due to persistent respiratory symptoms that were unresponsive to treatment. The patient was receiving immunosuppressive therapy for SLE. Upon hospitalization, computed tomography of the lungs revealed the presence of centrilobular nodules exhibiting tree-in-bud patterns, as well as bronchiectasis, predominantly in the middle and lower lobes. Subsequently, the patient underwent bronchoscopy, during which a BAL sample was obtained. Microscopic analysis of the sample indicated the presence of *L. blattarum*. Clinicians often focus on the primary symptoms of SLE, but they must also consider the risk of severe respiratory complications like lophomoniasis. This condition is critical to address in the management of SLE patients, who are immunosuppressed due to the disease's nature and its treatment.

KEYWORDS
Lophomonas, parasite infection, pulmonary infection, systemic lupus erythematosus

INTRODUCTION

Systemic lupus erythematosus (SLE) is a chronic and systemic autoimmune disorder that exhibits a relapsing–remitting pattern and is marked by the generation of diverse autoantibodies.[1] While individuals of any age or gender may be affected, the disease predominantly impacts females of childbearing age.[1,2] It significantly affects mortality rates among young women, and according to a meta-analysis of over 26,000 female patients in the United States, their overall mortality rate is 2.6 times higher than that of the general population.[3] The primary causes of mortality in SLE patients are disease activity, infections, and cardiovascular complications.[3,4]

The clinical manifestations of SLE are extensive, potentially involving nearly all organ systems, with severity ranging from mild cases without significant organ involvement to critical, life-threatening conditions. Common symptoms may include cytopenias, fever, malar and other dermatological rashes, oral lesions, polyarthralgia or non-erosive arthritis, vasculitis, and involvement of renal, neurological, cardiac, and pleuro-pulmonary systems.[1,5]

SLE pathogenesis involves a complex, multifactorial interplay of non-Mendelian genetic predispositions, hormonal factors, and environmental triggers. These elements disrupt both innate and adaptive immune responses. A key aspect of SLE is phagocytes' impaired clearance of apoptotic cells, which promotes autoreactivity in B and T cells. This leads to the production of autoantibodies and the formation of immune complexes (ICs) with nuclear and cytosolic antigens.[5–7] The classical complement pathway activation

worsens inflammation and tissue harm. In addition, these patients are treated with various types of immunosuppressive medications, which makes them more susceptible to Nemours infections.[1,5]

Lophomonas blattarum, a rare pulmonary protozoan, primarily exists as an endo-commensal in the gastrointestinal tracts of cockroaches. Symptoms of *L. blattarum* infection include cough, dyspnea, pneumonia, bronchiectasis, and pleural effusions.[8]

Pulmonary *Lophomonas* is typically found in tropical and subtropical regions. The disease is more commonly reported in countries with warmer climates and higher populations of cockroaches. Most cases have been documented in Brazil, India, and Southeast Asia. Also reported in Iran, Turkey, Peru, Panama, and Mexico. The studies demonstrated a 91.85% prevalence of *Lophomonas* in Asia, 7.2% in America, 0.65% in Europe, and 0.3% in Africa. However, pulmonary *Lophomonas* may be underreported in other regions due to a lack of awareness or misdiagnosis, as it can resemble other respiratory infections.[9]

Diagnostic radiographic imaging, such as chest x-rays and CT scans, typically reveals migratory infiltrates and bronchial obstruction. Bronchoscopy may show narrowed airways and congested bronchial mucosa with hyperplasia and necrosis. Diagnosis usually involves bronchoscopy with brush smears or alveolar lavage fluid analysis, and treatment commonly consists of metronidazole or tinidazole, which yield favourable clinical outcomes.[10,11]

In this case report, we discuss a patient with a 20-year history of SLE, who presented with respiratory symptoms lasting 2 months and did not respond to outpatient treatment. Investigations led to a diagnosis of pulmonary infection due to Lupomoniasis.

CASE PRESENTATION

A 61-year-old female was referred to the emergency department of Sayyad Shirazi Hospital in Gorgan, Iran, with a primary complaint of respiratory issues persisting for the past 2 months. She presented with symptoms including dyspnea, a non-purulent cough, fatigue, chills, and fever. There was no documented history of nocturnal sweating, hemoptysis, unintentional weight loss, or decreased appetite. These symptoms had exacerbated over the preceding month and had not completely improved despite outpatient care. The patient's medical history included SLE, ischemic heart disease, and hypertension. Her SLE was diagnosed based on arthralgia, malar rash, oral ulcers, positive ANA and anti-dsDNA tests, as well as leukopenia and thrombocytopenia 20 years ago. During the physical examination, her vital signs were noted to be stable, and her oxygen saturation was measured at 95% without supplementary oxygen. The patient exhibited class 2 dyspnea. Auscultation revealed respiratory wheezing and crackles, while heart sounds (S1 and S2) were found to be normal. Abdominal and pelvic examinations indicated no significant abnormalities, and there were no indicators of splenomegaly, hepatomegaly, or lymphadenopathy. Prednisolone 5 mg twice daily, hydroxychloroquine (HQ) 200 mg daily, and methotrexate (MTX) 7.5 mg weekly were in her medication history. The patient's respiratory infection symptoms failed to improve with outpatient treatment, necessitating hospitalization due to the persistence of symptoms and abnormal examination findings. The initial evaluation comprised laboratory tests and chest x-rays, which indicated patchy consolidations in both the lungs and tram track sign in the right lobe (Figure 1). Laboratory results revealed anaemia, with an erythrocyte sedimentation rate (ESR) of 32 mm/s, while C-reactive protein (CRP) levels were negative. White blood count was 6.7 $\times$ 10^3/μL (neutrophil 84%), and platelet level was 131,000/μL. Serum creatinine was 1 mg/dL, and in urine analysis, protein 1+ was observed.

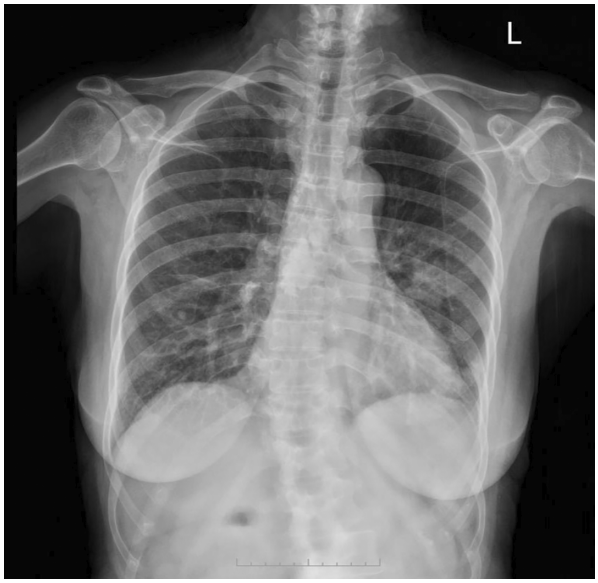

FIGURE 1 The initial chest x-rays showed patchy consolidations in both lungs and bronchiectasis (tram track sign) in the right lobe.

Additional diagnostic imaging, including spiral computed tomography (CT) scans, was performed in light of the patient's clinical presentation and abnormal x-ray findings. Serum levels of perinuclear antineutrophil cytoplasmic antibodies (P-ANCA), cytoplasmic antineutrophil cytoplasmic antibodies (C-ANCA), and viral markers for human immunodeficiency virus, hepatitis B, and hepatitis C were normal. Furthermore, given the ongoing COVID-19 pandemic, a SARS-CoV-2 polymerase chain reaction (PCR) test was conducted, yielding a negative result. An investigation for fungal infection using a serum galactomannan test was also carried out, which returned negative.

A cardiology consultation was requested for the patient. The electrocardiographic evaluation indicated normal left ventricular function, with an ejection fraction ranging from 50% to 55%, and revealed mild aortic insufficiency, with no evidence of pericardial effusion.

The spiral CT scan of the lungs revealed centrilobular nodules characterized by tree-in-bud patterns and bronchiectasis,

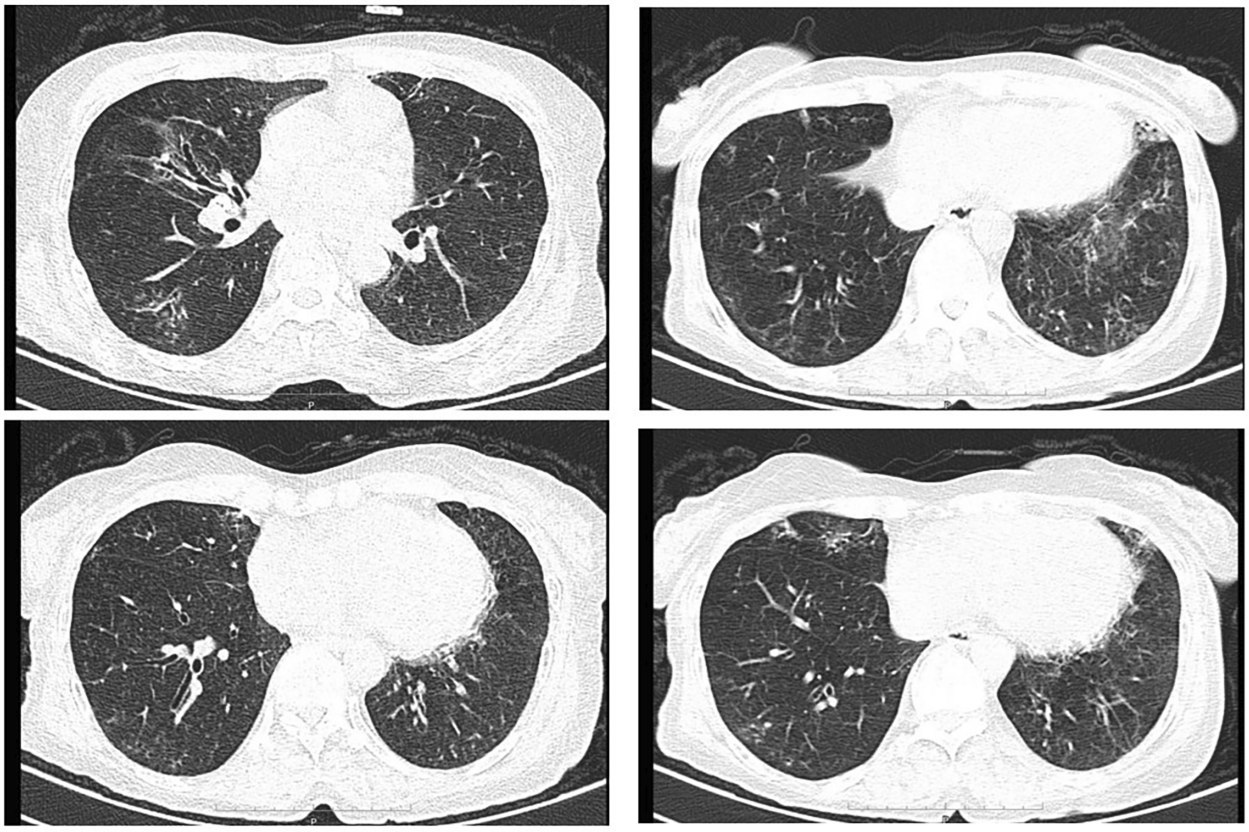

FIGURE 2 The spiral lung computed tomography scan showed the presence of centrilobular nodules exhibiting tree-in-bud patterns alongside bronchiectasis, predominantly located in the middle and lower regions of the lungs. No pleural effusion was detected.

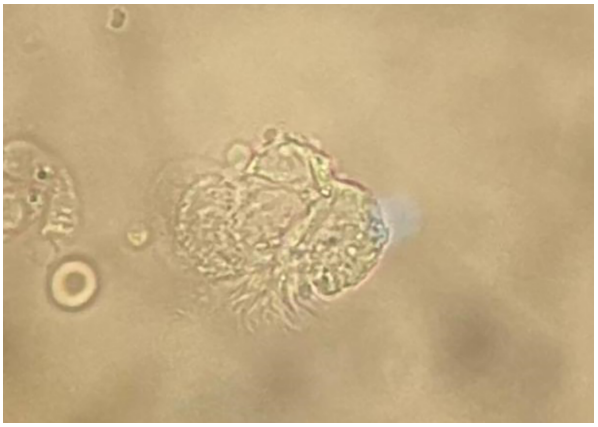

FIGURE 3 Microscopic analysis of the bronchoalveolar lavage samples identified a live, oval-shaped, flagellated Lophomonas protozoa.

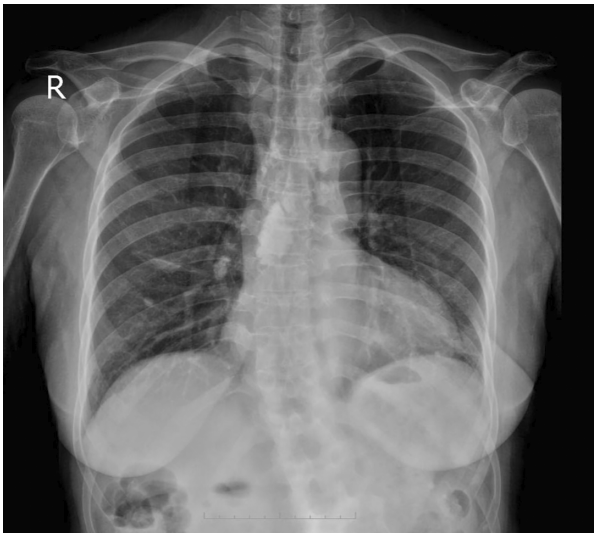

FIGURE 4 The patient's chest x-ray 2 weeks after the start of treatment demonstrates a reduction of consolidations in both lungs.

particularly in the middle and lower lung regions. Pleural effusion was not observed in the CT scan (Figure 2). Based on abnormal findings on the lung CT scan, fibre optic bronchoscopy was performed on the patient. During the procedure, a bronchoalveolar lavage (BAL) specimen was obtained to evaluate for the presence of BK (Bacillus of Koch), lophomonas, as well as bacterial and fungal infections. The BAL analysis did not indicate fungal or tuberculosis infections; however, gram-positive cocci were identified. Additionally, microscopic examination of the BAL samples revealed multiple live, oval, flagellated lophomonas protozoa (Figure 3).

Consequently, the patient was diagnosed with an active pulmonary lophomonas infection based on the positive BAL findings. Treatment with Metronidazole 500 mg every 8 h

was initiated. After 2 weeks of treatment her condition improved (Figure 4) and she was subsequently discharged with instructions for oral medication, reporting overall good health and improved clinical symptoms. In follow-up, after 6 months of treatment, there was no complaint of respiratory symptoms.

DISCUSSION

SLE is defined as a chronic autoimmune disease affecting multiple organ systems, leading to a wide range of clinical manifestations. It is also associated with a higher incidence of comorbidities, likely due to disease activity and corticosteroid or other immunosuppression treatments.[1,5] Respiratory involvement occurs in 50%–70% of SLE patients, with symptoms emerging as the initial sign in approximately 4%–5% of cases, though the exact prevalence is not well-defined. Respiratory manifestations can be classified as either acute or chronic and may arise as primary conditions directly linked to the disease or as secondary issues resulting from complications like infections. Acute manifestations are often correlated with overall disease activity, whereas chronic complications can progress independently.[5,12]

Infectious disease is the leading cause of morbidity and mortality in SLE patients, with approximately 50% experiencing severe infections during their illness. Infections account for 11% to 23% of hospitalizations in this population, and one-third of SLE-related deaths are linked to infections.[13] Bacterial infections are the most common, comprising 51.9% of all documented infections, followed by viral (11.9%) and fungal infections (2.3%). The most frequently affected sites include the respiratory tract (35.5%), urinary tract (15.0%), and soft tissues (13.3%).[14,15] In line with our case, the patient was undergoing treatment with oral CS, MTX, and HQ and experienced respiratory symptoms during the past 2 months, that did not improve with outpatient treatments. Positive pulmonary infection with *L. blattarum* and gram-positive cocci was detected during evaluation.

L. blattarum is a multi-flagellated protozoan classified within the supergroup Excavata and the class Parabasalia. This organism serves as an endocommensal inhabitant of the hindguts of various arthropods, including cockroaches, termites, and mites, which are typically present in domestic environments.[10,12,16] Human infection can occur via inhaling aerosols containing *L. blattarum* cysts released into the environment by cockroaches or through consuming food contaminated with these cysts.[10] Research indicates that lung infections caused by *L. blattarum* are more prevalent among individuals with immunodeficiencies or those undergoing immunosuppressive therapy. A case study conducted in 2024 highlighted the concurrent manifestation of tuberculosis, pulmonary hydatid cyst, and *L. blattarum* in a patient with a history of brain tumour and diabetes mellitus.[17]

A systematic search was conducted for studies on lophomoniasis cases from 1993 to March 2020, encompassing 27 years. This review includes publications detailing 307 global cases. Patients ranged from 1 month to 84 years, with a mean age of 23.7 years. The juvenile age group (≤18 years) accounted for the majority of cases (n: 171; 55.7%, $p < 0.04$). The male-to-female ratio was almost equal, showing no statistically significant difference. The highest number of cases (n: 237) was reported from Iran. Additionally, bronchoalveolar lavage (BAL) specimens were the most frequently used for diagnosing lophomoniasis ($p < 0.001$).[9] They also found that 34.1% of patients had immunocompromised conditions, whereas a review conducted in 2024 reported that about 89.6% of patients presented with similar conditions.[9,10]

Differentiating *L. blattarum* from ciliated epithelial cells through morphological analysis using a light microscope poses significant challenges, which may lead to misdiagnosis. Consequently, performing procedures such as bronchoscopy biopsy smears, sputum smears, or bronchoalveolar lavage (BAL) can facilitate the identification of *L. blattarum* in patients.[8,18] Infections due to *L. blattarum* typically manifest with atypical and non-specific clinical presentations, predominantly affecting the respiratory system and likely transmitted via airborne routes. These infections exhibit similarities in clinical presentation and radiographic findings.[10,17] The absence of distinctive symptoms complicates both diagnosis and treatment, making it difficult to distinguish these infections from other diseases. Radiological findings from x-rays and CT scans associated with these infections include ground-glass opacities, patchy consolidations, streaky or patchy shadows, cystic lesions, abscesses, and pleural effusion.[19,20] Our patient was admitted due to persistent respiratory symptoms with patchy consolidations in x-rays and centrilobular nodules, along with bronchiectasis in a lung CT scan. In addition, through BAL microscopic evaluation, the diagnosis was confirmed for her. In line with our study, Wahid et al., they reported a case of lophomoniasis infection in a SLE patient. The patient, treated with immunosuppressive medications, was admitted with non-specific respiratory symptoms and, ground glass appearance and patchy consolidation in her chest x-rays. The diagnosis of lophomoniasis infection was suggested through microscopic examination of the BAL sample.[21]

In a review conducted by Mewara et al. in 2024 on lophomoniasis infection, it was found that the most frequently reported symptoms were cough (70.69%), fever (60.35%), and expectoration (46.55%). Furthermore, a significant majority of the patients presented with comorbidities or associated conditions (89.66%). BAL samples were primarily utilized for diagnosis (82.76%), with microscopic examination demonstrating a detection rate of 100% for lophomoniasis, in contrast to PCR testing, which identified the infection in approximately 35% of cases.[10] similar to our patient, who was immunocompromised and initially exhibited cough and fever, her infection was confirmed through BAL sampling and microscopic analysis.

SLE can cause various respiratory symptoms in some patients, yet respiratory diseases are often overlooked in this context. One such condition is Lophomonas, an opportunistic protozoan that poses significant risks. The potential impact of Lophomonas and similar infections has not been adequately addressed, leaving SLE patients vulnerable to complications that may worsen their respiratory health. Clinicians frequently emphasize the obvious symptoms of SLE while overlooking the subtler yet serious respiratory issues. Routine screenings for respiratory symptoms and proactive infection management should be standard practice for SLE patients. Educating patients about the risks of infections will promote a more informed approach to their healthcare.[1,5,10]

The present study possesses several notable strengths. We documented an exceptionally rare instance of Lophomonas infection in a patient with SLE. Moreover, we successfully mitigated complications associated with each pathogen through timely diagnosis and appropriate therapeutic interventions. Nevertheless, certain limitations were encountered. The conclusive diagnosis of lophomoniasis necessitated the transfer of the patient's sample to an external facility, resulting in delays. Despite these delays in achieving a definitive diagnosis, our team maintained rigorous oversight of the patient's condition and effectively managed their symptoms throughout the process.

In conclusion, while clinicians typically focus on the primary symptoms associated with SLE, it is crucial to also pay attention to serious respiratory complications, such as lophomoniasis. This condition is particularly important to consider in SLE patients who are immunosuppressed due to both the nature of the disease and its treatment. Regular and thorough screening for respiratory symptoms is essential, and proactive management of potential infections should be a fundamental component of the overall care strategy for individuals living with SLE.

AUTHOR CONTRIBUTIONS

Mohammad Hadi Tajik Jalayeri and Mehrdad Aghaei advised the case report study. Mahdi Mazandarani gathered patient's medical and health records. Mahdi Mazandarani and Narges Lashkarbolouk wrote the first draft of the manuscript, and all authors commented on previous versions. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT

None declared.

DATA AVAILABILITY STATEMENT

The datasets used during the current study are available from the corresponding author on reasonable request. All data generated or analysed during this study are included in this article. Further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

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. The purpose of this case report was completely explained to the patient she was assured that his information would be keep confidential by the researchers. This case report was performed in line with principles of the declaration of Helsinki.

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