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Case report

Misleading presentation of staphylococcal pneumonia in an adolescent girl: a case report

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Abstract

S. aureus is a relatively uncommon causative agent of community-acquired pneumonia. The clinical presentation of staphylococcal community-acquired pneumonia is typically acute and severe. Rarely, its clinical and imaging features may mimic other lung diseases, thereby delaying and misleading the diagnosis. We report a case of a 13-year-old girl without predisposing factors who was admitted with a recent history of mild chest pain, weakness and slight fever. Although clinical presentation and imaging findings suggested tuberculosis infection, broncho-alveolar lavage results showed a positivity for methicillin-susceptible *S. aureus*. A complete recovery was observed after a 21-day course of antibiotics. Our case highlights that staphylococcal pneumonia may develop in adolescents without underlying risk factors, mimicking, in rare cases, clinical presentation and radiological features of pulmonary tuberculosis.

Keywords

Staphylococcus aureus, tuberculosis, pneumonia, pulmonary cavitations, children.

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Background

Approximately 5% of all cases of community-acquired pneumonia (CAP) are caused by *S. aureus*. Overall, infants and elderly individuals are more affected but, in several cases, healthy subjects with predisposing factors (such as infection of skin or soft tissues, influenza virus infection, history of recent hospital admissions, or immunocompromised status) may be affected [1].

Typically, the clinical presentation of staphylococcal CAP is acute and severe, with the most common symptoms and signs being high fever, shivering, dyspnea, cough and pleuritic chest pain. Moreover, it is not uncommon to detect leukocytosis and bacteremia [1, 2]. The clinical course may be variable, ranging from subacute to fulminant depending on the initial conditions of the patient [3, 4]. *S. aureus* has long been recognized as a cause of necrotizing pneumonia in children. In recent years, there has been considerable interest in the role of the staphylococcal virulence factor Panton-Valentine Leukocidin (PVL). PVL is a pore-forming toxin produced by some strains of *S. aureus* that have been associated with the development of necrotizing pneumonia, mainly in young immunocompetent individuals [5].

In rare cases of staphylococcal CAP, oligosymptomatic clinical presentation and imaging features may mimic other lung diseases, potentially resulting in a misleading diagnosis.

Case presentation

We report the case of a 13-year-old girl who was admitted to the Pediatric Clinic, University of Sassari, Italy, which is the referral Center for pediatric infectious diseases in Northern Sardinia. The patient had a history of mild chest pain and weakness in the last ten days, and slight fever in the last two days. No other symptoms such as cough, weight loss and nighttime sweating were reported. History was negative for other comorbidities.

On first physical examination, she was apparently well and had no fever, no dyspnea. A reduced breath sound intensity on the basis of the right lung was found, suggesting pulmonary involvement. The white cell blood count was raised (11,500/mm^3), with 70% neutrophils, and C-reactive protein (CRP) was 4.26 mg/dl.

Collectively, these findings were suggestive of a pulmonary infection.

Then, the patient underwent a chest X-ray, which showed bilateral consolidation areas with a central cavity. On the suspicion of pulmonary tuberculosis (TB), we carried out a chest computed tomography (CT), which showed multiple pulmonary cavitations surrounded by consolidation areas, and "ground glass" areas (**Figures 1A**, **1B** and **1C**). Examinations for TB including tuberculin skin test (TST), interferon gamma releasing assay (IGRA), and gastric aspirate for TB testing were negative. Serum aspergillus galactomannan antigen testing, anti-echinococcus antibodies, *S. pneumoniae* urinary antigen were also negative. In addition, blood tests for vasculitis and autoimmune diseases involving lung (e.g. pulmonary Wegener's granulomatosis), namely anti-neutrophil cytoplasmic antibodies (ANCA) and antinuclear antibodies (ANA), were negative.

Finally, bronchoscopy with broncho-alveolar lavage (BAL) was performed. Whilst waiting for the BAL culture results, we started an empiric antibiotic treatment with ampicillin IV (150 mg/kg per day in 4 doses) plus clarithromycin PO (15 mg/kg per day in 2 doses).

Unexpectedly, BAL results showed a positivity for methicillin-susceptible *S. aureus* (MSSA), establishing the staphylococcal etiology of pneumonia. Echocardiography was performed in order to rule out cardiac foci of infection potentially responsible for hematogenous bacterial dissemination. Lastly, serum immunoglobulin and complement levels, and T-lymphocyte subpopulations were found to be normal.

On the basis of antibiogram results, which showed the clarithromycin susceptibility of MSSA isolates and the ineffectiveness of ampicillin, clarithromycin was continued for a total of 21 days while ampicillin was discontinued after 10 days of treatment. Two weeks later, chest X-ray showed that lung lesions were partially resolved, while a chest CT scan documented an almost complete resolution of pulmonary lesions after three months (**Figures 1D**, **1E**, and **1F**).

Informed written consent for publication was obtained by parents of the patient.

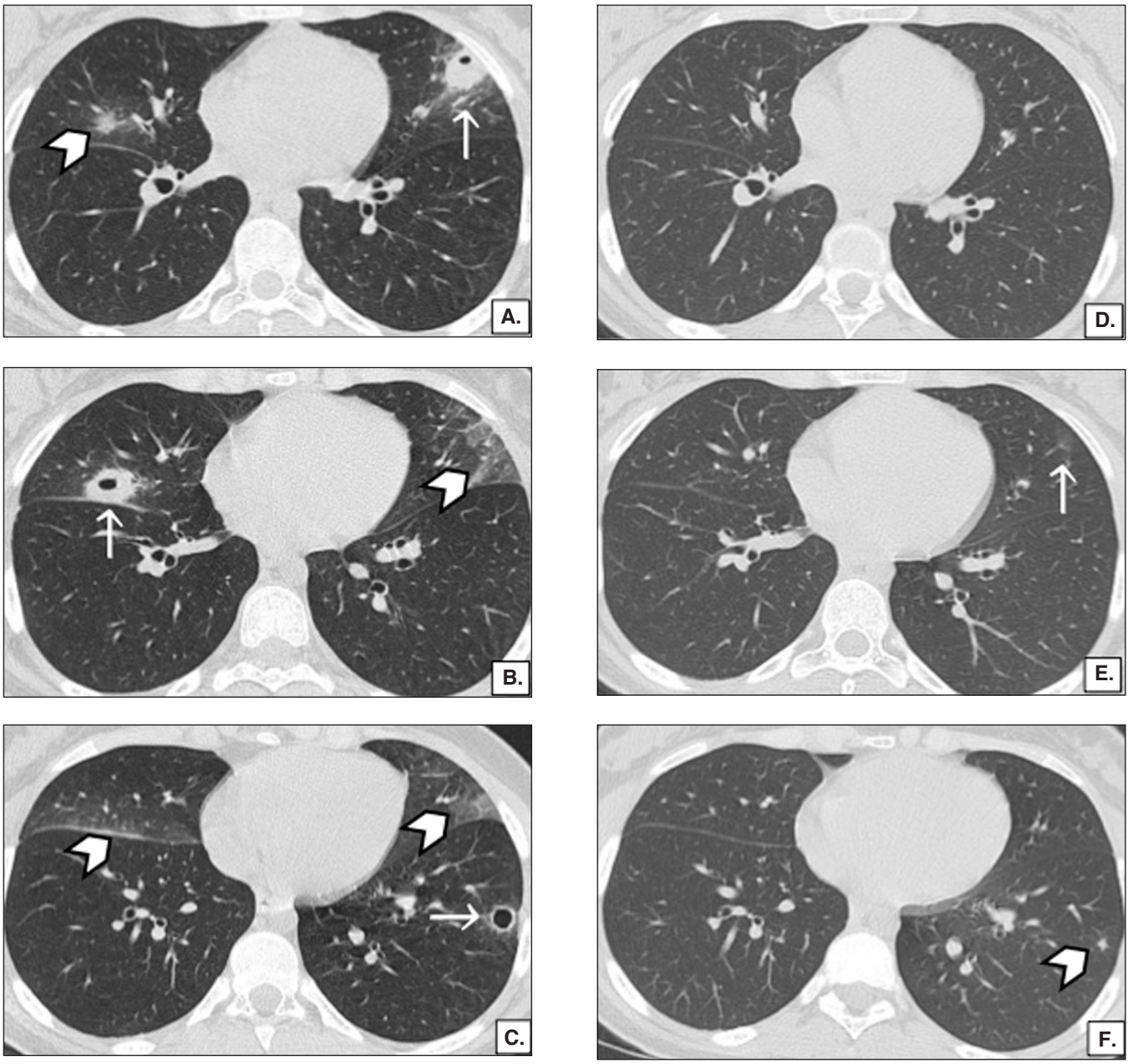

Figure 1. A, **B** and **C**: chest computed tomography (CT) at admission reveals multiple pulmonary cavitations surrounded by consolidation areas (arrows), and "ground glass" areas (head-arrows). One cavitation is located in the middle lobe of the right lung, and two are located in the left lung, one in the upper and one in the lower lobe. **D**, **E** and **F**: three-month follow-up chest CT shows almost complete resolution of the lung abnormalities. A tiny area of "ground glass" (arrow) persists in the upper lobe of the left lung, and a small area of pulmonary consolidation is seen in the lower lobe of the left lung (head-arrow).

Discussion

Staphylococcal pneumonia is a relatively uncommon CAP. In rare cases, its clinical presentation and correlated images may mimic pulmonary infections caused by slow-growing organisms, such as fungi or mycobacteria.

The clinical presentation of pulmonary TB ranges from asymptomatic to acute, but the most common is the paucisymptomatic presentation. Cough, anorexia, weight loss, fatigue, and fever are nonspecific complaints, which are frequently disregarded by the patient. Typically, TB pulmonary lesions are located in the apico-posterior segments and in the apical segments of the lower lobes. The development of the disease can take months to years to form cavities. Cavitation in one or multiple sites is radiographically evident in 40% of cases of post-primary disease. Of note, it can be difficult to distinguish thinwalled cavities from bullae, cysts, or pneumatoceles [6, 7].

In the literature, there are relatively few case reports focusing exclusively on staphylococcal CAP in children [1, 8]. Typically, the clinical presentation of this infection is acute and severe

and the most common symptoms and signs are high fever, shivering, dyspnea, cough and pleuritic chest pain. Staphylococcal infection should be considered in all cases of severe necrotizing CAP, especially when it rapidly progresses to cavitations [1, 4]. The interest of this case of staphylococcal CAP depends on the oligosymptomatic presentation, the "healthy appearance" of the patient, and the absence of predisposing factors. Cavitations, which are seen in 25% of *S. aureus* pneumonia, are common in other types of bacterial pneumonia, especially TB infection. The *S. aureus* pneumonia can result from hematogenous dissemination secondary to the infection of skin or soft tissues, as well as to infective endocarditis [1, 9]. The transmission route of the infection was not identified in our patient, however an hematogenous dissemination may be hypothesized.

Some authors reported community-acquired methicillin-resistant *S. aureus* (MRSA) infections in previously healthy young adults as well as in children without known risk factors for MRSA infection including recent hospitalization, admission from another hospital, prior antimicrobial use, and comorbidities [1, 10].

From a radiological point of view, chest CT is able to define a more specific pattern of abnormalities compared to chest X-ray in children with necrotizing pneumonia, and it allows an earlier diagnosis [11]. In our case, chest CT scan revealed necrotic areas in the lung at an early stage, allowing to optimize management, therapy and follow-up. Unfortunately, we were not able to test PVL positivity in *S. aureus* isolates.

Published guidelines support the early use of anti-staphylococcal antibiotics such as vancomycin or linezolid in cases of severe *S. aureus* infections to ensure a better antibiotic coverage; nevertheless, physicians do not seem to adhere to these guidelines since, in the majority of cases, these antibiotics are administered only if MRSA has been isolated [3, 12].

Our patient was affected by MSSA pneumonia and thus the use of vancomycin, linezolid or other anti-staphylococcal antibiotics was not mandatory, if considering the antibiotic susceptibility profile of this causative agent. The complete clinical and radiological recovery of our patient confirmed that the antibiotic treatment had been successful.

Conclusions

The present case report highlights that, albeit rarely, *S. aureus* necrotizing pneumonia may present with clinical-imaging dissociation in adolescents without underlying risk factors, thus mimicking other pulmonary diseases, particularly TB. *S. aureus* etiology should be always considered in the case of cavitating pneumonia, even if disease expression is oligosymptomatic. Finally, our case shows that the use of anti-staphylococcal antibiotics such as vancomycin or linezolid is not mandatory in patients with MSSA pneumonia, and may be restricted to MRSA infections.

Abbreviations

ANA: antinuclear antibodies
ANCA: anti-neutrophil cytoplasmic antibodies
BAL: broncho-alveolar lavage
CAP: community-acquired pneumonia
CRP: C-reactive protein
CT: computed tomography
IGRA: interferon gamma releasing assay
MSSA: methicillin-susceptible *S. aureus*
MRSA: methicillin-resistant *S. aureus*
PVL: Panton-Valentine Leukocidin
TB: tuberculosis
TST: tuberculin skin test

Declaration of interest

The Authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The Authors received no financial support for the research, authorship, and/or publication of this article.

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