International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2025: 7.089

Double Hit, No Quit: A Rare Case of Severe Community-Acquired Pneumonia with Septic Shock and Sequential Multilobar Progression

Dr. Rishikesh Jamiyar [1], Dr. Ravishankar SN[2]

[1]Junior Resident, Department of General Medicine, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bengaluru, Karnataka, India

[2]Professor & Head of Department, Department of General Medicine, Akash Institute of Medical Sciences and Research Centre, Devanahalli, Bengaluru, Karnataka, India

Abstract: ***Background: Severe community-acquired pneumonia (CAP) may rarely show radiological progression despite early appropriate antibiotic therapy. Case Presentation: A 35-year-old man presented with septic shock and severe hypoxemic respiratory failure secondary to CAP. Despite prompt intensive care and empirical antibiotics, serial chest radiographs showed worsening pulmonary infiltrates. Following multidisciplinary reassessment and escalation of antimicrobial therapy, sputum culture identified Klebsiella pneumoniae. The patient improved clinically with complete radiological resolution on follow-up. Conclusion: This case emphasizes that early radiological worsening in severe CAP does not necessarily indicate treatment failure. Serial imaging, careful clinical reassessment, and timely optimization of therapy are essential for successful outcomes.***

Keywords: Community-acquired pneumonia; Septic shock; *Klebsiella pneumoniae*; Respiratory failure; Serial chest radiography

1. Introduction

Community-acquired pneumonia continues to be one of the leading infectious causes of hospitalization and death worldwide. Although most patients respond favorably to timely empirical antimicrobial therapy, a small proportion develop severe disease characterized by respiratory failure, septic shock, and progressive pulmonary involvement requiring intensive care management. These patients often present significant diagnostic and therapeutic challenges because radiological changes may not accurately reflect the severity or evolution of the underlying infection during the early stages.[1–4]

Current international guidelines emphasize the prompt initiation of empirical antibiotics, aggressive hemodynamic stabilization, appropriate respiratory support, and continuous reassessment of treatment response. Nevertheless, some patients experience worsening radiographic findings despite initial clinical stabilization and guideline-directed therapy. Such clinicoradiological discordance may represent progression of infection, delayed radiographic resolution, resistant organisms, or evolving multilobar disease, and should prompt timely re-evaluation rather than reliance on a single imaging study.[1–4]

We report the case of a young adult with severe community-acquired pneumonia complicated by septic shock and acute hypoxemic respiratory failure who demonstrated sequential radiological progression despite early initiation of appropriate empirical antibiotics. Through close clinical monitoring, serial imaging, multidisciplinary decision-making, and timely escalation of antimicrobial therapy, the patient ultimately achieved complete clinical and radiological recovery. This case underscores the importance of individualized management and the value of repeated reassessment in critically ill patients with severe pneumonia.[1–4]

2. Case Presentation

A 35-year-old previously healthy male presented to the Emergency Department with complaints of high-grade fever associated with chills and productive cough for three days, followed by rapidly worsening breathlessness over the preceding 24 hours. The cough was associated with purulent expectoration without hemoptysis. There was no history suggestive of tuberculosis, bronchial asthma, chronic obstructive pulmonary disease, previous recurrent respiratory infections, diabetes mellitus, hypertension, chronic kidney disease, recent hospitalization, or immunosuppressive therapy. There was also no significant occupational exposure or recent travel history.[5–8]

On arrival, the patient appeared acutely ill, anxious, and in severe respiratory distress. Initial assessment revealed hypotension with a blood pressure of 80/60 mmHg, tachycardia with a pulse rate of 140 beats/minute, respiratory rate of 34 breaths/minute, and oxygen saturation of only 76% on room air. Peripheral cyanosis was present. General physical examination showed no pallor, icterus, clubbing, generalized lymphadenopathy, or pedal edema.[5–8]

Respiratory system examination demonstrated bilateral air entry with prominent bronchial breath sounds and coarse crackles over the right infra-axillary and infrascapular regions, suggestive of underlying pulmonary consolidation. Cardiovascular examination revealed normal first and second heart sounds without murmurs. Abdominal examination was unremarkable, and neurological evaluation demonstrated preserved higher mental functions with no focal neurological deficits.

Considering the patient's rapidly progressive respiratory symptoms together with profound hypoxemia and septic

shock, a provisional diagnosis of severe community-acquired pneumonia with Type I respiratory failure and septic shock was made based on clinical findings alone. In accordance with international recommendations, empirical intravenous piperacillin-tazobactam and azithromycin were initiated immediately without waiting for microbiological confirmation.[5–8]

The patient was admitted to the Medical Intensive Care Unit, where aggressive fluid resuscitation was commenced. Persistent hypotension despite adequate fluid administration necessitated initiation of noradrenaline infusion to maintain adequate mean arterial pressure. Arterial blood gas analysis demonstrated severe hypoxemic respiratory failure with respiratory acidosis, following which non-invasive ventilation (NIV) was instituted.[5–8]

Initial chest radiography demonstrated dense right middle-zone consolidation consistent with community-acquired pneumonia. However, the severity of systemic illness appeared disproportionate to the localized radiographic findings, raising suspicion of rapidly evolving pulmonary disease. Initial blood and sputum cultures failed to isolate any pathogenic organism. Despite gradual improvement in hemodynamic parameters, repeat chest radiography performed on Day 4 demonstrated progression of pulmonary consolidation rather than expected resolution.

Given the unexpected radiological deterioration, pulmonology consultation was sought on Day 5. Considering the possibility of severe resistant bacterial infection, antimicrobial therapy was escalated to intravenous meropenem and levofloxacin while intensive supportive care was continued.

A repeat chest radiograph obtained on Day 6 revealed development of a new infiltrative opacity involving an additional pulmonary zone, representing sequential radiological progression or the "double-hit" phenomenon. During this period, oral candidiasis was also observed, suggesting transient impairment of host immunity secondary to severe critical illness. The patient required transfer back to the MICU for close monitoring and intermittent ventilatory support.[5–8]

Despite the guarded prognosis, multidisciplinary management was continued with meticulous respiratory care, antimicrobial therapy, serial clinical reassessment, and repeated radiological evaluation. Over the subsequent week, the patient's oxygenation gradually improved, allowing successful weaning from ventilatory support and transfer to the general ward.[5–8]

Repeat sputum culture eventually yielded Klebsiella pneumoniae, which demonstrated susceptibility to piperacillin-tazobactam and carbapenems, thereby validating both the initial empirical therapy and subsequent antibiotic escalation. Serial chest radiographs showed gradual regression of pulmonary infiltrates by Day 15, followed by complete radiological resolution four weeks after admission.[1–15]

The patient completed a prolonged course of intravenous antibiotics and was discharged after approximately twenty days of hospitalization in a stable clinical condition with normal oxygen saturation on room air. At outpatient follow-up, he remained asymptomatic with complete radiological recovery and had resumed his routine daily activities.[5–8]

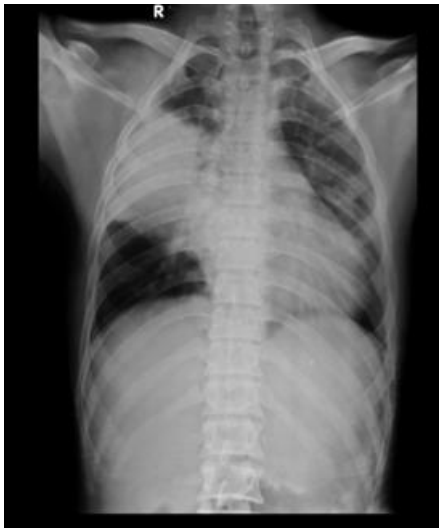


Figure 1: Initial chest radiograph obtained on admission demonstrating dense right middle-zone consolidation consistent with severe community-acquired pneumonia.

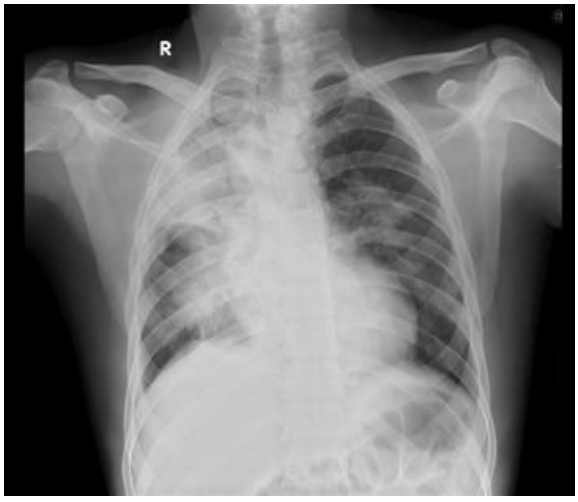


Figure 2: Repeat chest radiograph obtained on Day 4 demonstrating progression of pulmonary consolidation despite early initiation of guideline-directed empirical antibiotic therapy

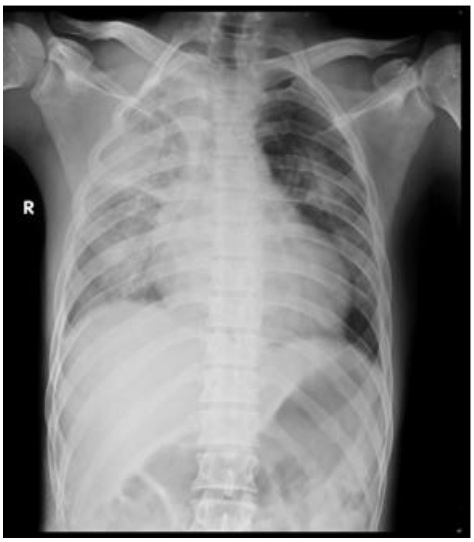
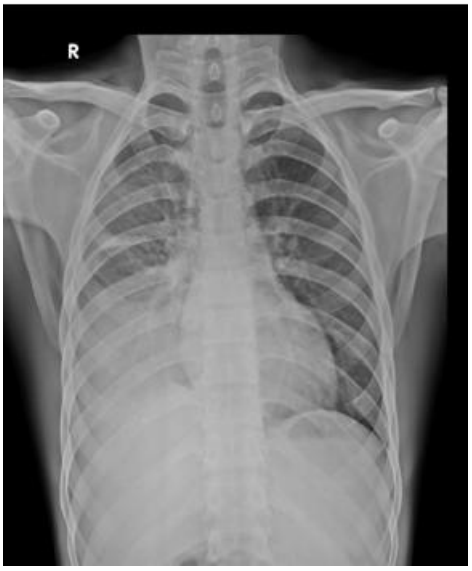


Figure 3: Chest radiograph on Day 6 showing development of a new infiltrative opacity involving an additional pulmonary zone, consistent with sequential radiological progression



Follow-up chest radiograph demonstrating early regression of pulmonary infiltrates following escalation of antimicrobial therapy and continued intensive supportive management

3. Discussion

Community-acquired pneumonia (CAP) remains one of the leading infectious causes of hospitalization and mortality worldwide despite advances in diagnostic techniques, antimicrobial therapy, and intensive care management. Although most patients respond favorably to early empirical antibiotic therapy, approximately 5–10% develop severe CAP requiring intensive care admission. Mortality increases substantially when pneumonia is complicated by septic shock, acute respiratory failure, or multiorgan dysfunction. Early recognition of disease severity and prompt institution of evidence-based management therefore remain fundamental determinants of patient outcome. Current ATS/IDSA guidelines recommend early administration of empirical antibiotics, microbiological investigations, appropriate respiratory support, and aggressive hemodynamic resuscitation in patients with severe CAP. [1–4]

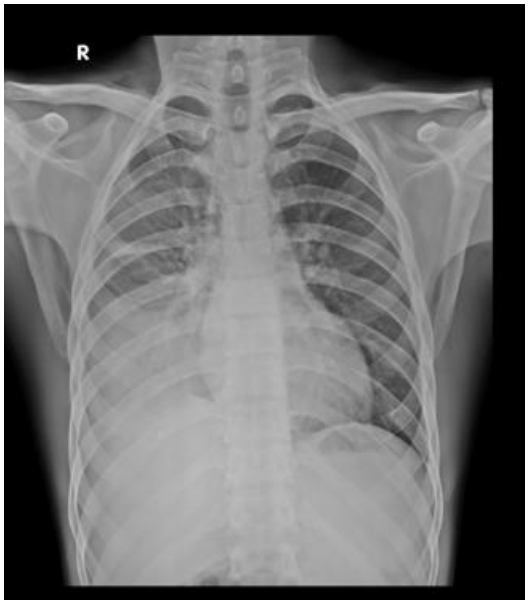


Figure 5: Serial chest radiograph showing marked regression of pulmonary infiltrates by Day 15, correlating with significant clinical improvement and successful weaning from ventilatory support

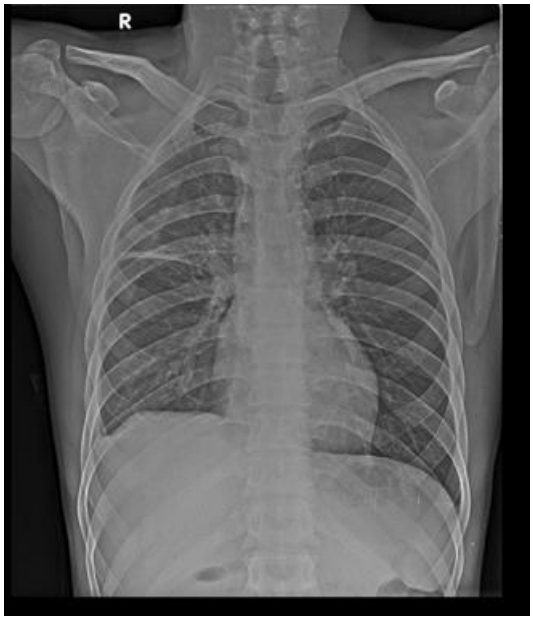


Figure 6: Follow-up chest radiograph obtained four weeks after admission demonstrating complete radiological resolution of pulmonary infiltrates with restoration of normal lung fields.

The present case is noteworthy because of the unusual clinicoradiological evolution despite adherence to guideline-directed management. The patient presented with fulminant respiratory symptoms, severe hypoxemia, and septic shock but demonstrated relatively localized consolidation on the initial chest radiograph. Within a few days, serial imaging revealed progression of pulmonary infiltrates with involvement of an additional pulmonary zone despite early empirical antimicrobial therapy. This sequential radiological progression, described in our report as the "double-hit"

phenomenon, represents an uncommon but clinically important pattern of disease evolution.[5–8]

One of the most significant observations in this patient was the marked discordance between clinical severity and the initial radiographic findings. Although chest radiography remains the first-line imaging modality for diagnosing pneumonia, radiological abnormalities frequently lag behind the underlying pathological process. In the early stages of severe infection, dehydration, neutropenia, or overwhelming inflammatory responses may result in underestimation of pulmonary involvement on plain radiographs. Similarly, radiological progression during the first 48–72 hours after initiating antibiotic therapy does not necessarily indicate therapeutic failure but may reflect continuing inflammatory recruitment, evolving alveolar exudation, or delayed radiographic resolution. Therefore, clinical judgment should always take precedence over isolated imaging findings, particularly in critically ill patients. [5–8]

The present patient fulfilled multiple ATS/IDSA criteria for severe CAP. The guideline identifies two major criteria- septic shock requiring vasopressors and respiratory failure requiring mechanical ventilatory support- and several minor criteria including respiratory rate ≥30 breaths/minute, multilobar infiltrates, hypotension requiring aggressive fluid resuscitation, and severe impairment of oxygenation. Presence of either one major criterion or three or more minor criteria identifies patients at high risk who require ICU-level care. Our patient fulfilled both major criteria in addition to multiple minor criteria, fully justifying admission to the Medical Intensive Care Unit and aggressive supportive management. [5–8]

Prompt initiation of empirical antibiotic therapy remains one of the strongest predictors of survival in severe CAP. International guidelines recommend that antimicrobial therapy should not be delayed while awaiting microbiological confirmation because delayed treatment has consistently been associated with increased mortality. In our patient, intravenous piperacillin-tazobactam combined with azithromycin was commenced immediately after clinical diagnosis, even before culture reports became available. Although initial blood and sputum cultures remained sterile, this approach was consistent with current evidence-based recommendations emphasizing early empirical coverage in critically ill patients. [5–8]

An important feature of this case was the subsequent isolation of Klebsiella pneumoniae from repeat sputum cultures. K. pneumoniae is a highly virulent Gram-negative bacillus capable of causing rapidly progressive pneumonia, severe systemic inflammation, septic shock, and respiratory failure. While traditionally associated with alcohol use disorder, diabetes mellitus, chronic lung disease, and healthcare-associated infections, severe infections may also occur in previously healthy individuals. Hypervirulent strains have increasingly been reported worldwide and are associated with extensive pulmonary involvement, metastatic infection, and increased mortality. The eventual microbiological identification of K. pneumoniae in our patient validated the clinical diagnosis and explained the unusually aggressive disease course.[5–8]

Another clinically relevant aspect of this case was the decision to escalate antimicrobial therapy following serial radiographic deterioration rather than waiting for definitive microbiological confirmation. Escalation to meropenem and levofloxacin was undertaken after multidisciplinary discussion with pulmonologists because progressive imaging findings suggested either evolving bacterial disease or inadequate antimicrobial coverage. Although later culture demonstrated susceptibility to piperacillin-tazobactam, escalation was clinically appropriate considering the patient's septic shock, worsening pulmonary infiltrates, and persistent critical illness. This emphasizes that antimicrobial decisions in severe CAP should integrate microbiological evidence with dynamic clinical assessment rather than relying exclusively on culture results, which are frequently negative during the early phase of illness.[5–8]

Serial chest radiography played a pivotal role throughout this patient's management. The first radiograph established the diagnosis of pneumonia, subsequent imaging documented disease progression despite treatment, and later radiographs objectively demonstrated response to therapy and complete recovery. While routine daily imaging is not recommended for all hospitalized patients with CAP, repeat radiological assessment is warranted whenever there is unexpected clinical deterioration, failure to improve, or concern regarding complications. In the present case, sequential imaging directly influenced therapeutic decision-making and ultimately guided successful management. [5–8]

The favorable outcome achieved in this patient also highlights the importance of multidisciplinary intensive care. Successful recovery resulted not from antibiotic therapy alone but from comprehensive supportive management that included early recognition of septic shock, aggressive fluid resuscitation, vasopressor support, non-invasive ventilatory assistance, meticulous monitoring, repeated clinical reassessment, microbiological surveillance, and timely consultation with pulmonology specialists. Such integrated management remains essential for improving survival among critically ill patients with severe pneumonia.[5–8]
This case contributes to the growing body of literature emphasizing that clinical improvement and radiological resolution do not always occur simultaneously. Apparent radiological worsening during the early course of treatment should not automatically be interpreted as treatment failure. Instead, clinicians should evaluate the overall clinical trajectory, inflammatory response, microbiological data, and oxygenation status before modifying therapy. Recognition of this clinicoradiological discordance may prevent premature discontinuation of effective antibiotics while allowing timely escalation when clinically justified.

Finally, the complete clinical and radiological recovery observed in our patient despite initial septic shock and progressive pulmonary involvement demonstrates that favorable outcomes remain achievable with prompt diagnosis, evidence-based antimicrobial therapy, serial imaging, multidisciplinary decision-making, and persistent intensive supportive care. We believe that this case provides an important educational message for clinicians managing severe CAP and reinforces the principle that careful

longitudinal assessment often offers greater diagnostic value than isolated clinical or radiological observations.[5–8]

4. Conclusion

This case highlights the dynamic and potentially unpredictable clinical course of severe community-acquired pneumonia (CAP), emphasizing that early radiological findings may not always correlate with the severity of the underlying disease. Our patient developed sequential radiological progression despite prompt initiation of guideline-directed empirical antibiotic therapy, illustrating the phenomenon of clinicoradiological discordance that can complicate clinical decision-making. Such progression should not be interpreted as immediate treatment failure but should instead prompt comprehensive reassessment, including repeated clinical evaluation, serial imaging, microbiological investigations, and consideration of alternative diagnoses or evolving disease.[5–8]

The successful outcome in this patient was achieved through early recognition of severe CAP, prompt initiation of empirical broad-spectrum antibiotics, aggressive management of septic shock, timely respiratory support, multidisciplinary collaboration, and judicious escalation of antimicrobial therapy based on the evolving clinical picture. The eventual isolation of Klebsiella pneumoniae confirmed the infective etiology and supported the antimicrobial strategy adopted during the course of treatment.[5–8]

This case reinforces the importance of integrating bedside clinical assessment with serial radiological evaluation rather than relying solely on initial imaging or microbiological results. Continuous monitoring, adherence to evidence-based guidelines, and individualized patient management remain essential for improving outcomes in critically ill patients with severe CAP. Reporting such uncommon clinical presentations contributes to the growing body of literature and provides valuable insights for clinicians managing rapidly progressive pneumonia, ultimately promoting earlier recognition, timely intervention, and improved patient survival.[5–8]

References

[1] Metlay JP, Waterer GW, Long AC, et al. Diagnosis and Treatment of Adults with Community-acquired Pneumonia. Am J Respir Crit Care Med. 2019; 200(7): e45-e67.
[2] Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society Consensus Guidelines on CAP. Clin Infect Dis. 2007;44 Suppl 2: S27-S72.
[3] Torres A, Cilloniz C, Niederman MS, et al. Pneumonia. Nat Rev Dis Primers. 2021; 7: 25.
[4] World Health Organization. The top 10 causes of death. Geneva: WHO; 2024.
[5] Fine MJ, Auble TE, Yealy DM, et al. A prediction rule to identify low-risk patients with CAP. N Engl J Med. 1997; 336: 243-50.
[6] Lim WS, van der Eerden MM, Laing R, et al. Defining community acquired pneumonia severity on presentation. Thorax. 2003; 58: 377-82.
[7] Kalil AC, Metersky ML, Klompas M, et al. Management of Adults With HAP and VAP. Clin Infect Dis. 2016; 63: e61-e111.
[8] Rhodes A, Evans LE, Alhazzani W, et al. Surviving Sepsis Campaign. Intensive Care Med. 2017; 43: 304-77.
[9] Prina E, Ranzani OT, Torres A. Community-acquired pneumonia. Lancet. 2015; 386: 1097-108.
[10] Musher DM, Thorner AR. Community-acquired pneumonia. N Engl J Med. 2014; 371: 1619-28.
[11] Jain S, Self WH, Wunderink RG, et al. Community-Acquired Pneumonia Requiring Hospitalization. N Engl J Med. 2015; 373: 415-27.
[12] Woodhead M, Blasi F, Ewig S, et al. Guidelines for CAP in adults. Clin Microbiol Infect. 2011;17 Suppl 6: E1-E59.
[13] Kumar A, Roberts D, Wood KE, et al. Duration of hypotension before antimicrobial therapy. Crit Care Med. 2006; 34: 1589-96.
[14] Podschun R, Ullmann U. Klebsiella spp. as nosocomial pathogens. Clin Microbiol Rev. 1998; 11: 589-603.
[15] Metlay JP, Waterer GW. Community-acquired pneumonia. N Engl J Med. 2024; 390: 1234-45.