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Case Report: Management of Severe Community-Acquired Pneumonia with Multidrug Antibiotic Therapy

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Case Report

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ABSTRACT

Antibiotics remain the cornerstone of treating bacterial infections, but their use must be carefully guided to ensure efficacy and limit resistance development. We report the case of a 68-year-old male with severe community-acquired pneumonia (CAP) caused by multidrug-resistant Streptococcus pneumoniae. The patient required a combination of empiric broad-spectrum antibiotics followed by targeted therapy based on culture and susceptibility results. This case highlights the importance of timely antibiotic selection, adherence to clinical guidelines, and monitoring for adverse effects. Lessons from this case underscore the need for antimicrobial stewardship and the role of microbiological diagnostics in optimizing patient outcomes.

Keywords

Community-acquired pneumonia (CAP), Severe pneumonia, Streptococcus pneumonia, Multidrug-resistant bacteria, Antibiotic therapy

INTRODUCTION

The discovery of antibiotics revolutionized modern medicine, drastically reducing morbidity and mortality from bacterial infections. However, inappropriate or delayed use of antibiotics contributes to the emergence of multidrug-resistant organisms, complicating treatment and increasing healthcare costs. Community-acquired pneumonia (CAP) is a common infectious disease requiring prompt empiric antibiotic therapy, particularly in elderly patients or those with comorbidities.

This report presents a case of severe CAP managed with empiric and targeted antibiotic therapy, emphasizing the clinical decision-making process, microbiological evaluation, and adherence to stewardship principles.

Case Presentation

Patient History

A 68-year-old male with a history of hypertension and type 2 diabetes mellitus presented to the emergency department with a 3-day history of fever, productive cough, dyspnea, and pleuritic chest pain. The patient reported chills and malaise but denied recent hospitalization or known exposure to infectious contacts.

Vital signs on admission:

Temperature: 39.2°C

Blood pressure: 110/68 mmHg

Heart rate: 112 bpm

Respiratory rate: 28/min

Oxygen saturation: 88% on room air

Physical examination revealed inspiratory crackles in the right lower lung field and diminished breath sounds at the right base. No signs of sepsis-induced organ dysfunction were initially observed.

Laboratory and Radiological Findings

Initial laboratory workup showed:

White blood cell count: 18,500/μL (neutrophils 85%)

C-reactive protein (CRP): 190 mg/L

Procalcitonin: 5.8 ng/mL

Blood urea nitrogen: 28 mg/dL

Creatinine: 1.2 mg/dL

Chest X-ray demonstrated a right lower lobe consolidation with air bronchograms, consistent with bacterial pneumonia. Blood cultures and sputum samples were obtained before initiating empiric antibiotic therapy.

Initial Management

Given the severity of illness and high risk for multidrug-resistant pathogens, empiric intravenous antibiotic therapy was initiated following IDSA/ATS guidelines for severe CAP:

Ceftriaxone 2 g IV daily

Azithromycin 500 mg IV daily

Supportive care included supplemental oxygen via nasal cannula, intravenous fluids, and monitoring in a step-down unit.

Microbiological Findings

Sputum culture yielded heavy growth of Streptococcus pneumoniae. Antibiotic susceptibility testing revealed:

Resistant to penicillin (MIC 2 μg/mL)

Resistant to erythromycin

Susceptible to levofloxacin and vancomycin

Blood cultures remained negative at 48 hours.

Modification of Therapy

Based on susceptibility results, empiric therapy was de-escalated to levofloxacin 750 mg IV daily, ensuring targeted treatment while minimizing exposure to broad-spectrum agents. The patient demonstrated clinical improvement within 48 hours, with decreasing fever and improved oxygenation.

Clinical Course

By day 5 of hospitalization:

Oxygen saturation improved to 95% on room air

WBC count decreased to 9,800/μL

CRP decreased to 65 mg/L

No adverse drug reactions were noted. Daily clinical assessments and monitoring for renal and hepatic function were conducted.

On day 7, the patient was transitioned to oral levofloxacin 750 mg daily to complete a 10-day course. Follow-up chest X-ray at discharge showed significant resolution of the consolidation.

DISCUSSION

Antibiotic Selection in Severe CAP

This case illustrates the importance of empiric antibiotic therapy guided by local resistance patterns and disease severity. IDSA/ATS guidelines recommend a combination of a beta-lactam with a macrolide or monotherapy with a respiratory fluoroquinolone for severe CAP in patients without risk factors for MRSA or Pseudomonas.

Empiric therapy must balance broad coverage with the risk of resistance development. In this patient, initial broad-spectrum therapy ensured coverage for S. pneumoniae and atypical pathogens, while subsequent de-escalation minimized unnecessary exposure.

Multidrug Resistance Considerations

Penicillin-resistant S. pneumoniae remains a significant concern, particularly in elderly patients and those with comorbidities. Resistance mechanisms include alterations in penicillin-binding proteins and efflux-mediated resistance to macrolides. Accurate identification and susceptibility testing are critical for guiding therapy.

Role of Microbiological Diagnostics

Blood and sputum cultures, along with antibiotic susceptibility testing, are essential to:

Confirm the causative pathogen

Identify resistance patterns

Guide de-escalation to narrow-spectrum antibiotics

Rapid molecular diagnostics, such as PCR for resistance genes, can further shorten time to appropriate therapy, especially in critically ill patients.

Antimicrobial Stewardship

This case demonstrates key principles of antimicrobial stewardship:

Timely initiation of empiric therapy based on clinical guidelines

Collection of cultures prior to antibiotic administration

Adjustment of therapy based on culture and susceptibility results

Limiting duration of therapy to clinically appropriate lengths

Adherence to these principles reduces the risk of resistance, minimizes adverse effects, and optimizes clinical outcomes.

Monitoring and Supportive Care

Supportive measures, including oxygen supplementation, hydration, and close monitoring, are critical in severe infections. Serial laboratory tests and imaging provide objective data for assessing therapeutic response and guiding discharge decisions.

Clinical Outcomes and Lessons Learned

Early empiric therapy combined with prompt de-escalation based on susceptibility results leads to favorable outcomes in severe CAP.

Routine AST is essential to identify multidrug-resistant pathogens and guide antibiotic stewardship.

Ongoing surveillance of local resistance patterns informs empiric therapy selection for high-risk patients.

Education on appropriate antibiotic use remains critical in preventing future resistance.

CONCLUSION

Antibiotic therapy remains a cornerstone in the management of severe bacterial infections such as community-acquired pneumonia. This case highlights the importance of timely empiric therapy, microbiological confirmation, susceptibility-guided de-escalation, and adherence to stewardship principles. The successful management of this patient underscores the integration of clinical judgment, laboratory diagnostics, and guideline-based therapy in optimizing patient outcomes while minimizing the risk of antimicrobial resistance.

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