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Acute Respiratory Distress Syndrome: A Clinical Case Report and Review of Management

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Case Report

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ABSTRACT

Acute Respiratory Distress Syndrome (ARDS) is a life-threatening condition characterized by acute onset of hypoxemic respiratory failure and bilateral pulmonary infiltrates not fully explained by cardiac causes. It is commonly associated with sepsis, pneumonia, trauma, and aspiration. Despite advances in supportive care, ARDS continues to have high morbidity and mortality. This case report presents a patient with ARDS secondary to severe pneumonia, highlighting clinical presentation, diagnostic evaluation, management strategies, and outcomes. The report also discusses current evidence-based approaches to ARDS management, emphasizing the importance of early recognition and multidisciplinary care.

KEYWORDS

Acute respiratory distress syndrome, Severe pneumonia, Mechanical ventilation, Lung-protective ventilation, Prone positioning

INTRODUCTION

Acute Respiratory Distress Syndrome (ARDS) is a severe inflammatory condition of the lungs characterized by increased pulmonary vascular permeability, diffuse alveolar damage, and refractory hypoxemia. First described in 1967, ARDS remains a major cause of critical illness in intensive care units worldwide.

The Berlin definition classifies ARDS based on severity using the PaO_2/FiO_2 ratio, with categories of mild, moderate, and severe. Common etiologies include sepsis, pneumonia, aspiration of gastric contents, trauma, and pancreatitis. The underlying pathophysiology involves an inflammatory cascade leading to disruption of the alveolar-capillary barrier, resulting in pulmonary edema and impaired gas exchange.

This case report aims to present a detailed clinical scenario of ARDS, along with a discussion of diagnostic criteria, management strategies, and clinical outcomes.

CASE PRESENTATION

Patient information

A 58-year-old male with a history of hypertension and type 2 diabetes mellitus presented to the emergency department with complaints of fever, productive cough, and progressive shortness of breath for five days. The patient also reported generalized weakness and decreased oral intake.

Clinical findings

On examination, the patient appeared acutely ill and in respiratory distress.

- Temperature: 38.9°C
- Blood pressure: 100/65 mmHg
- Heart rate: 112 beats per minute

- Respiratory rate: 32 breaths per minute
- Oxygen saturation: 85% on room air

Auscultation of the chest revealed bilateral coarse crackles, more pronounced in the lower lung fields.

Diagnostic assessment

Laboratory investigations showed:

Elevated white blood cell count (15,000/mm^3)

Elevated C-reactive protein and procalcitonin

Arterial blood gas analysis: PaO_2 55 mmHg on 60% FiO_2

Chest radiography demonstrated bilateral diffuse alveolar infiltrates. A computed tomography (CT) scan of the chest confirmed widespread ground-glass opacities consistent with severe pneumonia.

Echocardiography revealed normal left ventricular function, ruling out cardiogenic pulmonary edema.

Based on the Berlin criteria, the patient was diagnosed with moderate ARDS.

Therapeutic Intervention

The patient was admitted to the intensive care unit (ICU) and managed with a multidisciplinary approach.

1. Oxygen Therapy and Mechanical Ventilation

Due to worsening hypoxemia, the patient was intubated and placed on mechanical ventilation using a lung-protective strategy:

- Low tidal volume (6 mL/kg predicted body weight)
- Plateau pressure <30 cm H_2O
- Positive end-expiratory pressure (PEEP) optimization

2. Prone Positioning

The patient was placed in the prone position for 16 hours per day to improve oxygenation. This intervention significantly enhanced ventilation-perfusion matching.

3. Pharmacological Management

- Broad-spectrum intravenous antibiotics were initiated for suspected bacterial pneumonia
- Sedation and analgesia were administered to facilitate mechanical ventilation
- Neuromuscular blocking agents were used temporarily for severe hypoxemia
- Conservative fluid management strategy was followed

4. Supportive Care

- Hemodynamic support with intravenous fluids and vasopressors
- Nutritional support via enteral feeding
- Prevention of complications such as deep vein thrombosis and stress ulcers

Follow-Up and Outcomes

Over the course of 10 days, the patient showed gradual improvement in oxygenation and inflammatory markers. Repeat chest imaging demonstrated partial resolution of infiltrates.

The patient was successfully weaned off mechanical ventilation on day 12 and transferred to a general ward. After further recovery, he was discharged home with outpatient follow-up.

At a one-month follow-up visit, the patient reported mild exertional dyspnea but was otherwise stable.

DISCUSSION

ARDS is a complex syndrome with high mortality rates, ranging from 30% to 50% depending on severity. Early recognition and prompt management are critical to improving outcomes.

Pathophysiology

ARDS involves three overlapping phases:

- Exudative Phase: Characterized by alveolar edema and inflammation

- Proliferative Phase: Involves repair and proliferation of type II pneumocytes
- Fibrotic Phase: May lead to permanent lung damage in severe cases

Diagnosis

The Berlin definition outlines key diagnostic criteria:

- Acute onset within one week of a known insult
- Bilateral opacities on imaging
- Respiratory failure not explained by cardiac causes
- Impaired oxygenation based on PaO_2/FiO_2 ratio

Management Strategies

1. Lung-Protective Ventilation

Low tidal volume ventilation is the cornerstone of ARDS management and has been shown to reduce mortality.

2. Prone Positioning

Prone positioning improves oxygenation and survival in patients with severe ARDS.

3. Fluid Management

A conservative fluid strategy helps reduce pulmonary edema and improve lung function.

4. Pharmacological Therapies

While no specific drug cures ARDS, supportive medications play a crucial role. Corticosteroids may be considered in selected cases.

5. Extracorporeal Membrane Oxygenation (ECMO)

ECMO is used in severe, refractory cases where conventional ventilation fails.

Complications

Patients with ARDS are at risk of several complications:

- Ventilator-associated pneumonia
- Barotrauma
- Multiorgan failure
- Long-term pulmonary fibrosis
- Prognosis

The prognosis of ARDS depends on the underlying cause, severity, and comorbidities. Survivors may experience long-term physical and psychological impairments.

CONCLUSION

This case report highlights the clinical presentation and management of ARDS secondary to severe pneumonia. Early diagnosis, prompt initiation of lung-protective ventilation, and supportive care are essential for improving patient outcomes.

Despite advances in critical care, ARDS remains a challenging condition with significant morbidity and mortality. Continued research is needed to develop targeted therapies and improve survival rates.

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