



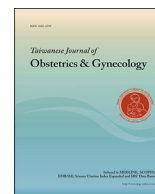
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Case Report

The prone position ventilation (PPV) as an approach in pregnancy with acute respiratory distress syndrome (ARDS)

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ABSTRACT

Objective: In Taiwan, the overall incidence of acute respiratory distress syndrome (ARDS) is 15.74 per 100,000 person-years, the mortality rate is 57.8%, and its overall prevalence in the intensive care unit (ICU) is 10.4%. Women who are pregnant and have ARDS have a high risk of fetal death and fetal asphyxia.

Case report: A 26-1/7-week pregnant woman presented with upper respiratory infection symptoms progressing to ARDS. While receiving ventilation, maintaining a prone position is an option for pregnant patients with severe ARDS. This case demonstrated a supplementary approach for pregnant women with ARDS.

Conclusion: Prone position ventilation is indicated for pregnant women, as for any patient with ARDS. The Prone Severe ARDS Patients trial showed no difference in the complication between pregnant patients and other groups.

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Introduction

Acute respiratory distress syndrome (ARDS) is a life-threatening disease that affects approximately 200,000 patients each year in the United States and causes 75,000 deaths annually [1]. ARDS is a rapidly progressive respiratory failure, leading to fluid leakage into the lungs as the main complication, which makes breathing difficult or impossible. The diagnostic criteria of ARDS are defined by the ratio of the partial pressure of oxygen in a patient's arterial blood (PaO₂) to the fraction of oxygen in the inspired air (FiO₂), as well as a PaO₂/FiO₂ less than 200 mmHg and less than 300 mmHg in acute lung injury (ALI). In Taiwan, the overall incidence of ARDS is 15.74 per 100,000 person-years, the mortality rate is 57.8%, and its overall prevalence in the intensive care unit (ICU) is 10.4% [2]. Pregnant women are considered a vulnerable population due to several risk factors that would require advanced level of care.

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Case presentation

A 33-year-old primigravid woman at 26-1/7 weeks of gestation presented with fever and upper respiratory infection (URI) in our clinic unit. She underwent regular prenatal care in our hospital and had been administered antibiotics because of the preliminary suspicion of tonsillitis. She was transferred to our emergency unit due to persistent URI symptoms (Fig. 4.1) and fever, which reached up to 38.8 °C. Her husband was also diagnosed with acute URI.

Pink, puffy sputum was observed after 3 days of admission, which led to the suspicion of an advanced infection with pulmonary edema (Fig. 4.2).

Thus, she was transferred to the ICU upon administration of a broad-spectrum antibiotic drug for further management.

High-flow nasal cannulation was implemented following the detection of shortness of breath and oxygen desaturation; in addition, the patient refused to undergo endotracheal (ET) intubation. Her vital signs and respiratory condition were monitored throughout the process.

ET intubation was performed because of respiratory failure. The infection specialist administered tamiflu (750 mg BID) to manage the potential lung infection, although there was a negative indication of influenza Ag.

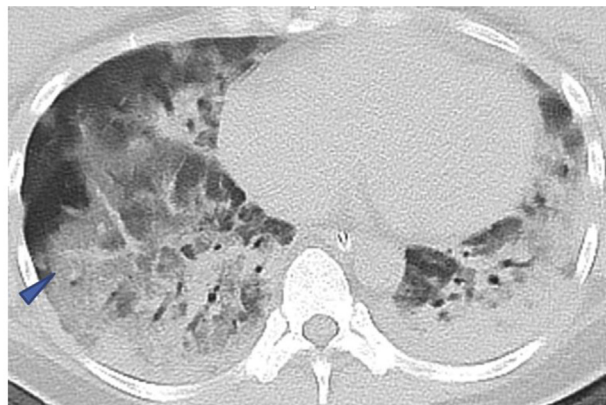


Fig. 1. Prone position.



Fig. 2. Low tidal volume.

(1)



(2)

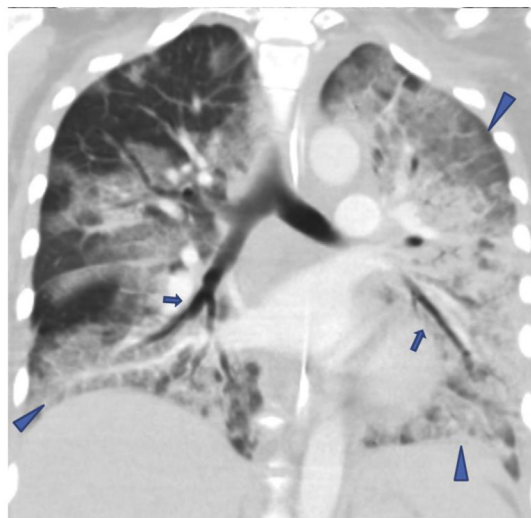


Fig. 3. Chest computed tomography images in axial (1) and coronal (2) demonstrate diffuse ill-defined ground glass opacities and consolidations involving all pulmonary lobes, mainly in the dependent regions. Air bronchogram (arrows) is visible bilaterally. A crazy paving appearance (arrowheads) is also delineated by the presence interlobular septal thickening and superimposed patchy ground-glass opacities.

Unfortunately, non-reassuring fetal heartbeats were noted at 07:04, which was not detected at 07:35; therefore, hysterostomy with the removal of the stillborn was performed at 08:04.

Computed tomography showed ground-glass opacities and consolidations with dependent lung predominance involving both pulmonary lobes, leading to the suspicion of an inflammatory or infectious process (Fig. 3). ALI was indicated; therefore, the standard protocol including the prone position (Fig. 1) and low tidal volume (alveolar protection) (Fig. 2) for ARDS was suggested by the chest medicine (CHE) expert. In addition, extracorporeal membrane oxygenation was considered if necessary.

After a series of treatments, the lung condition and function improved based on a series of chest X-ray images. Therefore, the ET tube was extubated (Fig. 4.4), and the patient was transferred to the general ward. However, a lung function test showed poor lung function with a forced vital capacity of 40% and first forced expiratory volume of 38%. After consultation with a CHE doctor and rehabilitation physician, the patient underwent a rehabilitation program after discharge to prevent remission and improve muscle strength.

Discussion

Women who are pregnant and have ARDS have a high risk of fetal death and fetal asphyxia [3]. In particular, a rare complication of a pregnant woman with ARDS is the requirement for mechanical ventilation, accounting for only 0.1%–0.2% of pregnancies [4].

Low tidal volume and optimum positive end-expiratory pressure with invasive mechanical ventilation is the standard treatment for ARDS [4]. Meanwhile, ventilation in prone position is indicated for pregnant women, as for any patient with ARDS. This position provides optimal relief of umbilical artery compression compared to the supine, left lateral, and right lateral positions when measuring the arterial systolic–diastolic ratio [5].

However, considering the fetal wellbeing, the prone position has not been applied to pregnant patients with ARDS, despite many reports suggesting its benefit in rescue therapy. The Prone Severe ARDS Patients trial showed no difference in the complication between pregnant patients and other groups [6].

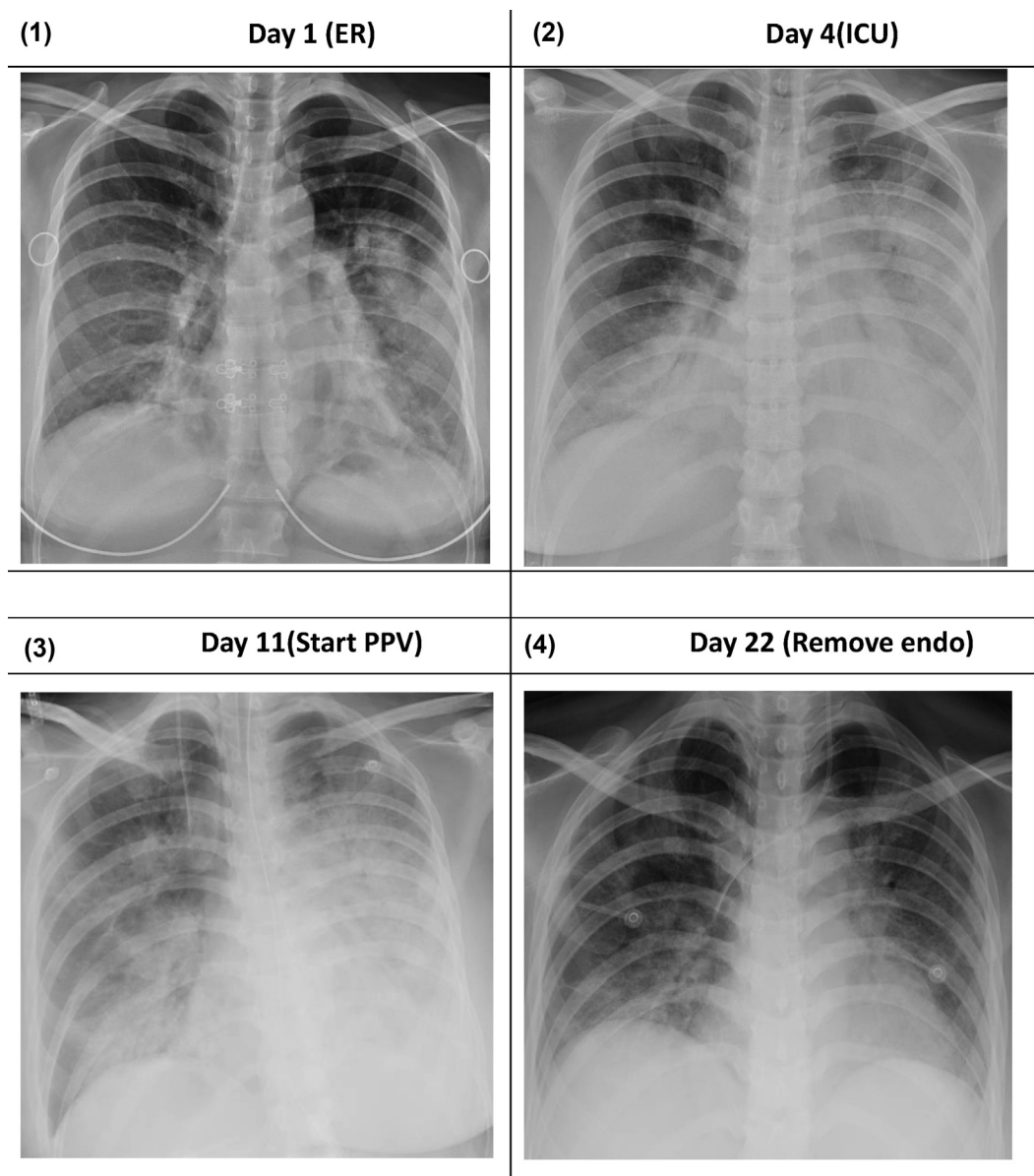


Fig. 4. Lung condition by arranging chest x-ray image. (1) Chest radiograph shows multifocal bilateral alveolar opacities with a perihilar and lower lung predominance. (2) 4 days follow up chest radiograph shows a progression of bilateral air space opacification. Air bronchogram is also depicted. (3) 11 days follow up chest radiograph shows diffuse bilateral ground glass opacities and consolidations. A central venous line, nasogastric tube and endotracheal tube are present. (4) 22 days follow up chest radiograph shows bilateral reticular opacities and reveals an improvement of the lung condition.

Conclusion

The prone position could reduce mortality in patients with ARDS [6,7]. However, little research and evidence support its efficacy in pregnant patients with severe ARDS who have received ventilation in the prone position. This study demonstrated that the prone position may be an option for patients who are pregnant but should be implemented with caution. However, more research must be conducted for further validation. The time for delivery is already a difficult decision for an obstetrician, and close follow-up of the natural course of ARDS as a maternal disease is currently the safest approach.

Declaration of competing interest

There is no conflict of interest by any author.

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