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# Mendelson's syndrome complicated by bacterial aspiration pneumonia triggered by right putamen bleeding: A case report

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## ABSTRACT

We present the case of an 80-year-old woman with Mendelson's syndrome complicated by bacterial aspiration pneumonia caused by consciousness loss followed by vomiting resulting from putamen bleeding. Her condition worsened rapidly to develop respiratory failure, within a few hours; thereafter, she was intubated. *Streptococcus agalactiae* and *Klebsiella oxytoca* were detected from the aspirated sputum sample culture. She was diagnosed with acute respiratory distress syndrome with Mendelson's syndrome complicated by bacterial aspiration pneumonia. Corticosteroid and antibiotic administration improved her condition and led to successful extubation; therefore, these treatment modalities were invaluable. We suggest the clinical considerations for the corticosteroid and antibiotic use in such cases.

## 1. Introduction

Mendelson's syndrome is originally named after an American obstetrician and gynecologist, Curtis Mendelson, who reported severe aspiration pneumonia after vaginal delivery under general anesthesia [1]. It currently refers to severe aspiration chemical pneumonitis caused by aspiration of gastric contents under any condition associated with consciousness disorders. Rather than a bacterial pneumonia caused by aspiration of indigenous bacteria in the oral cavity, it is an acute chemical pneumonitis caused by regurgitation of gastric contents and subsequent aspiration that develops rapidly. In addition, it causes severe pneumonia because of acute lung tissue damage caused by digestive enzymes and may be complicated by acute respiratory distress syndrome (ARDS). In this setting, the treatment benefit of steroids and antibiotics remains debatable.

Pneumonia is also an occasional complication of stroke, with an incidence rate of 5–38% [2–6]; therefore, the possibility of bacterial pneumonia because of aspiration of oral bacteria should also be considered after a stroke. ARDS could be developed because of bacterial and aspiration pneumonia. This report outlines the case of a patient in

whom successful extubation and treatment with steroids and antibiotics for Mendelson's syndrome triggered by right putamen bleeding, were performed. Considering the complex condition of Mendelson's syndrome, which was further complicated by bacterial aspiration pneumonia, and the invaluable option with steroids and antibiotics, this case report would provide meaningful insights for clinical practice.

## 2. Case presentation

An 80-year-old woman, who was a non-smoker and had a history of hypertension, presented to our facility with acute dyspnea. At 7.40 a.m. on a day of May 2020, she suddenly developed fecal incontinence, left hemiplegia, dextroversion, dysarthria, and vomiting. She was last seen by her family members at around 1.00 p.m. the day before. At 8.20 a.m., she was transported to the emergency department of our hospital. She had impaired consciousness, with a Japan coma scale score of II-10, as she opened her eyes when her name was called in a loud voice and on shaking. Head computed tomography (CT) findings showed right thalamus and putamen bleeding, and she was treated conservatively. The Glasgow coma scale score was 12; the vital signs were as follows: systolic

**Abbreviations:** ARDS, acute respiratory distress syndrome; CRP, C-reactive protein; CT, computed tomography; FiO<sub>2</sub>, fraction of inspired oxygen; ICU, intensive care unit; PaO<sub>2</sub>, partial pressure of oxygen in arterial blood; SpO<sub>2</sub>, oxygen saturation of arterial blood; WBC, white blood count.

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blood pressure, 91 mmHg; respiratory rate, 24/min; and oxygen saturation of arterial blood (SpO<sub>2</sub>), 86% (with supplemental oxygen administration of 4 L/min by a nasal cannula, during the initial examination in the emergency room). The oral hygiene of the patient was poor. Neurological findings were suggestive of an intracranial lesion. Physical findings were diminished breath sounds on the left side and coarse crackles in the right lung; however, a decrease in breath sounds was also apparent in the front of the chest.

Her respiratory condition deteriorated rapidly in the emergency room, and the SpO<sub>2</sub> level could not be maintained at 90% even after administration of oxygen using an oxygen mask with a reservoir bag at 10 L/min. Endotracheal intubation was performed and mechanical ventilation was initiated. Chest CT findings showed bilateral infiltration, and the patient was admitted to the intensive care unit (ICU) for the management of severe pneumonia.

Blood test results showed a decreased leukocyte count (1900/μL), mildly elevated C-reactive protein (CRP) level (3.6 mg/dL), and respiratory failure with a partial pressure of oxygen in arterial blood (PaO<sub>2</sub>) of 64 mmHg with supplemental oxygen administration of 4 L/min. In contrast, the hepatorenal function was normal (Table 1). Chest radiography at admission showed extensive infiltration shadows, mainly in the left whole lung fields and in the right lower lung field (Fig. 1a). On admission, head CT showed a hematoma extending from the right basal ganglia and putamen to the thalamus (Fig. 2). A low absorption area that appeared as cerebral edema was also observed surrounding the hematoma, and conservative treatment was performed as indicated. Chest CT findings at admission revealed consolidations admixture with ground-glass opacities mainly in the middle lobe of the right lung and the upper and lower lobes of the left lung (Fig. 3). Regarding the severity of pneumonia, the A-DROP [7] score corresponded to patient age, increased blood urea nitrogen, decreased SpO<sub>2</sub>, and impaired

consciousness; hence, the patient required admission to the ICU. Moreover, the antigen test for coronavirus disease 2019 was negative.

The clinical course of the patient is presented in Fig. 4. The cause of pneumonia was thought to be chemical pneumonitis because of aspiration of gastric contents caused by the initial vomiting, and it was rapidly worsening. In addition to the evident episode of vomiting, resulting in a very rapid decline of her respiratory status and bilateral infiltration on her chest CT image, she was diagnosed with Mendelson's syndrome just after mechanical ventilation initiation. Sputum culture predominantly showed the presence of *Streptococcus agalactiae* and *Klebsiella oxytoca* in a concentration of  $\geq 10^7$  colony-forming units/mL. As they were in sufficient numbers, they were considered as the bacteria that caused the infection [8]. In addition, because of poor oral hygiene, aspiration bacterial pneumonia was considered to be a potential complication. Following leukocytopenia (white blood count [WBC], 1900/μL) and the low serum CRP level (3.6 mg/dL) on admission, respiratory viral pneumonia might have been considered the initial differential diagnosis (Fig. 4). The WBC and the serum CRP level were elevated. It would be a reasonable interpretation that leukocytopenia corresponded to her severe infection, and that the low serum CRP level at admission indicated that this patient was transferred to out hospital in a very early phase of the infectious disease.

Management was started in the ventilator mode with synchronous intermittent mandatory ventilation with pressure control ventilation, administration of intravenous Sivelestat sodium hydrate (as a part of the lung-protection strategies), and using the antibiotics meropenem and levofloxacin. The patient's pneumonia satisfied the Berlin definition of ARDS [9]. The ventilator mode as synchronous intermittent mandatory ventilation with pressure control ventilation was chosen as a part of the lung-protection strategies by permitting patient's spontaneous respiration. The low tidal volume strategy with permissive hypercapnia was not considered, as intracranial hypertension might be suspected because of the presence of cerebral hemorrhage. The partial pressure of oxygen in arterial blood/fraction of inspired oxygen (PaO<sub>2</sub>/FiO<sub>2</sub>: P/F ratio) was 128.75. Pneumonia of this type is classified as that with "moderate severity." Therefore, prednisolone was initiated at 1 mg/kg/day. During the course, she had no fever and her temperature never exceeded 37 °C. The infiltration shadows observed at the time of admission improved by Day 12 (Fig. 1b). Since the P/F ratio improved and was maintained at  $\geq 250$ , she was extubated on the same day. She was transferred to the Department of Neurosurgery on Day 22, and, then, to a rehabilitation hospital for sequelae of stroke.

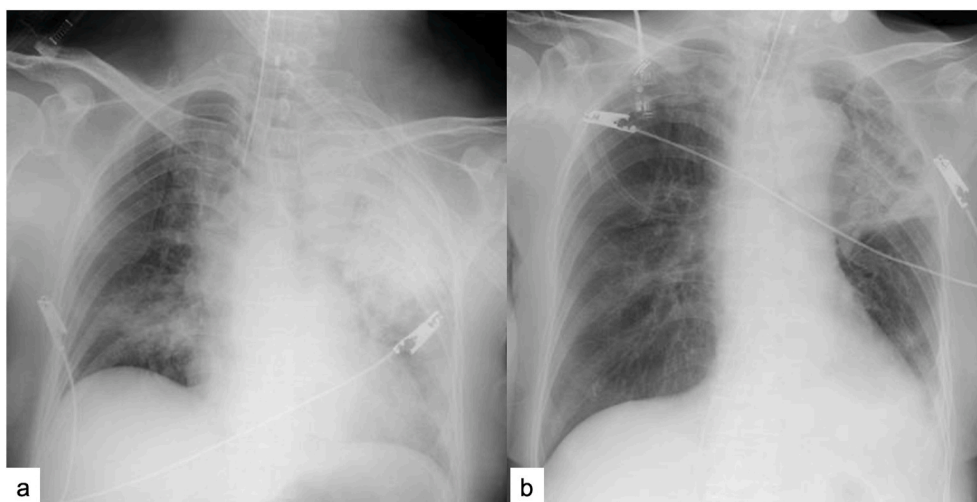
### 3. Discussion

Herein, we discuss the case of a patient with Mendelson's syndrome complicated with aspiration bacterial pneumonia that was managed with corticosteroid and antibiotic administration. Although the potential value of corticosteroid use for the treatment of Mendelson's syndrome and aspiration pneumonia, and that of antibiotic use for the treatment of Mendelson's syndrome remain debatable, our case report suggested that these comprehensive treatment strategies might have clinical relevance.

The patient was successfully extubated after ARDS because of Mendelson's syndrome and bacterial aspiration pneumonia using a moderate dose of steroid (prednisolone; 1 mg/kg/day) and antibiotics. The use of steroids in pneumonia is controversial. First, steroids are used in severe pneumonia for their anti-inflammatory action, and the principal actions are improvement in fever/general condition, anti-shock, improvement in gas exchange during respiration, suppression of pulmonary fibrosis, and cytokine production [10]. Second, septic syndrome may lead to ARDS. Although the effects of short-term high-dose steroid therapy regarding the prevention of ARDS or decrease in mortality in patients with sepsis were reported to be negative in the 1980s [11–13], clinical trials were conducted, in which 30 mg/kg methylprednisolone were administered four times daily. This was an ultra-high dose administered,

**Table 1**  
Results of blood tests at the time of admission.

WBC	1900 (L)	/μL
Stab	18.5	%
Seg	45.0	%
Mono	8.5	%
Lym	23.5	%
Hb	13.2	g/dL
Hct	40.1	%
Plt	184	$\times 10^3/\mu\text{L}$
TP	6.6	g/dL
Alb	3.6 (L)	g/dL
CK	304 (H)	U/L
AST	25	IU/L
ALT	14	IU/L
LD	283	IU/L
BUN	27 (H)	mg/dL
Cre	0.7	mg/dL
eGFR	64	ml/min/1.73
BNP	278.7 (H)	pg/mL
HbA1c	6.1	%
TG	34	mg/dL
T-Chol	178	mg/dL
HDL	68	mg/dL
Na	145	mmol/L
K	3.4 (L)	mmol/L
Cl	105	mmol/L
corrected Ca	9.2	mg/dL
P	2.8	mg/dL
T-bil	1.2	mg/dL
CRP	3.6	mg/dL
APTT	27.5	Sec
PT	85.1	%
D-dimer	8.5 (H)	μg/ml
ABG (O <sub>2</sub> 4L)		
PH	7.43	
PaCO <sub>2</sub>	33	mmHg
PaO <sub>2</sub>	64 (L)	mmHg
HCO <sub>3</sub> <sup>-</sup>	22	mmol/L



**Fig. 1.** a) Chest radiography at admission (Day 1) showing extensive infiltration shadows, mainly in all left lung fields and in the right lower lung field. b) Improvement in the infiltration shadows by Day 12.



**Fig. 2.** Head computed tomography at admission showing a hematoma extending from the right basal ganglia and putamen to the thalamus.

and the status of infection control remained unknown. In addition, the use of stress-dose steroid has been recommended in the acute phase for improving circulatory insufficiency caused by relative adrenal insufficiency occurring secondary to septic shock [14]. Meduri et al [15] conducted a study that included patients with early phase severe ARDS in whom steroid intervention (starting methylprednisolone with 1 mg/kg/day for 28 days) was initiated within 72 h from diagnosis. Significant effects of steroid use on the duration of mechanical ventilation, ICU stay, and ICU mortality were observed. In addition, the treatment group had a lower infection rate than the control group. In studies evaluating the efficacy of steroids in patients with pneumonia, a significant improvement in treatment response was observed in the group, in which steroids were used within 3 days from the onset of pneumonia, compared with the group in which they were not [16]. Most studies have failed to show the effectiveness of steroid use for reduction of overall mortality in patients with community-acquired pneumonia; however,

the emerging outcome with time to clinical stability that was defined in prospective studies could show the significant effect for usage with steroids (prednisolone, 50 mg/day for 7 days). Time to clinical stability was defined as the time until observing stable vital signs for at least 24 h [17,18]. A recent systematic review described better odds ratio for all-cause mortality, length of ICU and hospital stay, and length of clinical stability in the ICU in a subgroup of patients with severe community-acquired pneumonia. They concluded that systemic steroids for hospitalized patients with severe community-acquired pneumonia is a preferred strategy [19].

Mendelson's syndrome has a rapid onset, and early intervention with corticosteroids might improve the treatment response, similar to that observed in this case. However, a study has also advocated against the use of corticosteroids for the management of chemical pneumonitis [20]. These controversial guidelines regarding corticosteroid use suggested that ARDS has various phenotypes and that treatment strategies may vary across phenotypes [21]. Generally, palliative antibiotics for Mendelson's syndrome should not be administered even in patients with radiographic findings of an infiltrate until the patient's clinical condition warrants their use [22]. In fact, 64 non-fatal cases of Mendelson's syndrome mostly caused by liquid aspirations showed radiographic resolution within 7 days and clinical recovery within 36 h without the use of antibiotics [1]. The patient's oral hygiene was poor in this case; therefore, in such cases, Mendelson's syndrome triggered by stroke or bleeding might need treatment with antibiotics because it may be often complicated by bacterial pneumonia. In real-world settings, it is often difficult to determine the quality of the aspirate in most cases. In more than 25% of cases, suspicious chemical aspiration pneumonitis might be superimposed by bacterial aspiration pneumonia [23]. Therefore, a combination of bacterial and chemical lung injury may not be rare. This case was accompanied by impaired consciousness associated with cerebral hemorrhage, and we strongly suspected the aspiration of gastric contents and indigenous bacteria in the oral cavity. Although no work to date has reported that steroid administration may be effective in patients with pneumonia caused by pathogen bacteria similar to those observed in our case (i.e., *Streptococcus agalactiae* and *Klebsiella oxytoca*), Torres et al. [24] showed the usefulness of corticosteroid administration for severe bacterial pneumonia and high inflammatory response.

This study has some limitations. Especially, this case report could not provide any conclusion on whether the combination usage of steroids and antibiotics would be effective in such a complicated case; however, using these comprehensive medications could prove valuable in such cases, although the administration of both medications remains

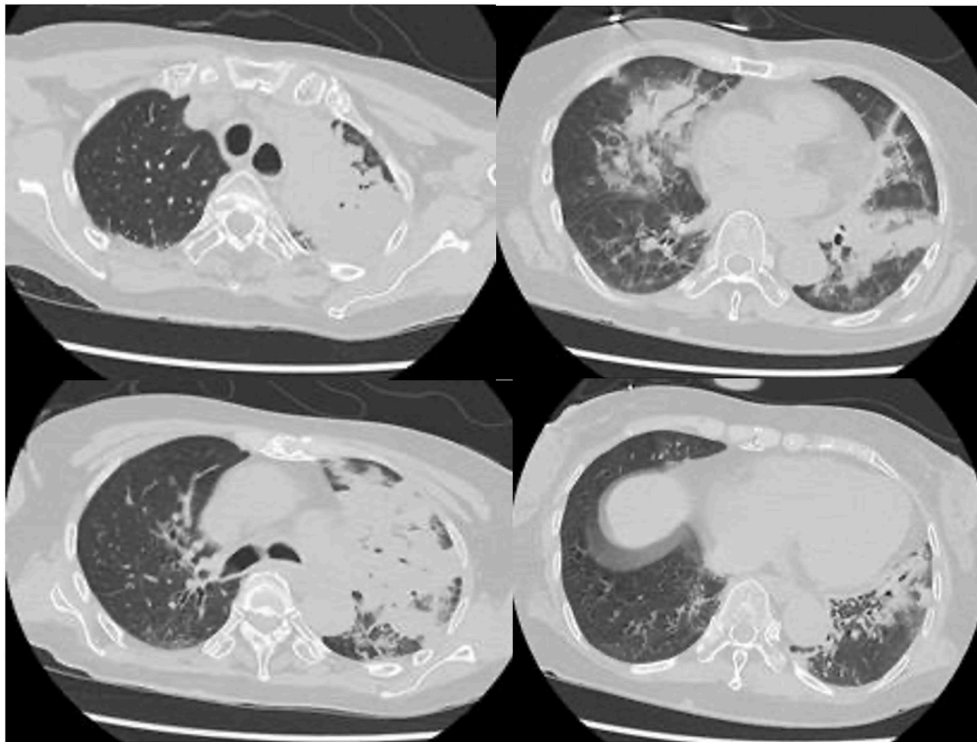


Fig. 3. Chest computed tomography at admission showing consolidation with segmental ground-glass opacities primarily in the middle lobe of the right lung and in the upper and lower lobes of the left lung.

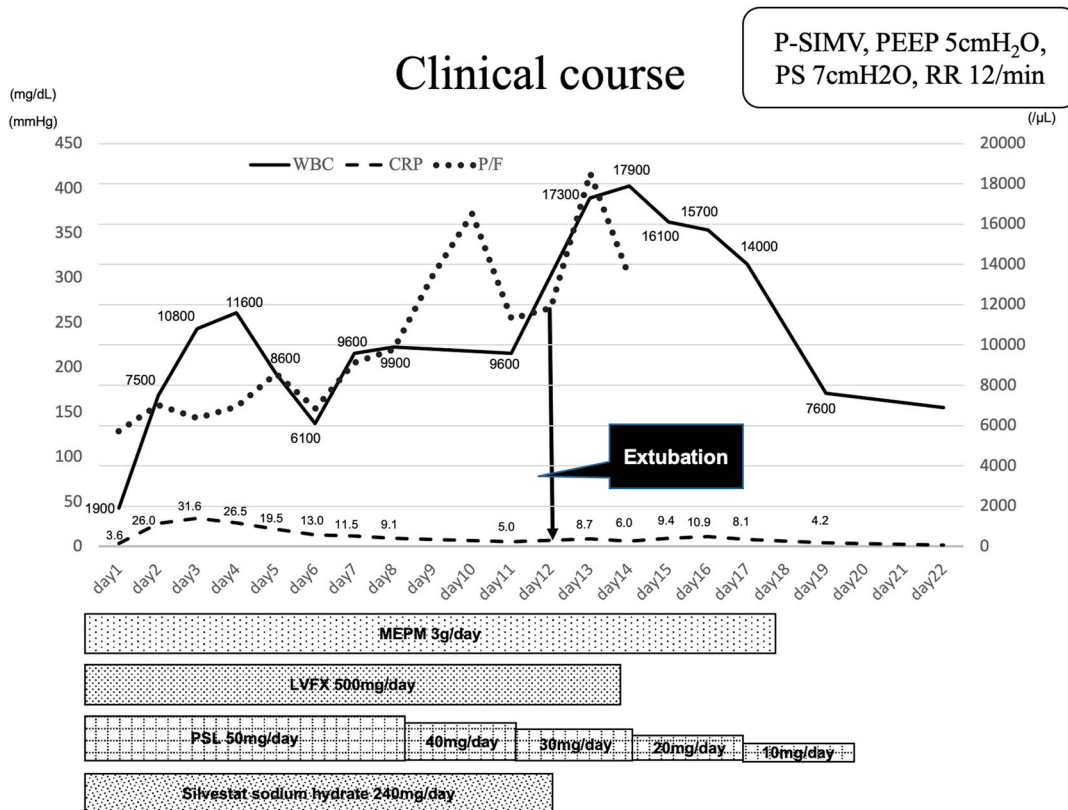


Fig. 4. The clinical course. Management in the ventilator mode was started using meropenem and levofloxacin. The partial pressure of oxygen in arterial blood/fraction of inspired oxygen (PaO<sub>2</sub>/FiO<sub>2</sub>: P/F ratio) was 128.75. Prednisolone was started at 1 mg/kg/day. The infiltration shadows observed at admission improved by Day 12. Since the P/F ratio improved and was maintained at ≥250, she was extubated on the same day.



debatable.

#### 4. Conclusion

- Treatments with corticosteroids and antibiotics remain debatable
- However, they might be reasonable in cases of patients with Mendelson's syndrome with bacterial aspiration pneumonia.

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#### Ethics approval and consent to participate

This study was conducted following the Code of Ethics Declaration of Helsinki of the World Medical Association. This case report was approved by the local Ethics Committee of Toranomon Hospital (approval number 2164, Feb./17th/2020).

#### Consent for publication

Written informed consent for publication of this case report and the associated images was obtained from the patient's relative (patient's son).

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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