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Case Report

A Child with 3p Deletion Syndrome Who Recovered from Influenza-Related Acute Respiratory Distress Syndrome

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Abstract

Influenza virus can cause serious complications, especially in patients with comorbid illnesses. Acute respiratory distress syndrome (ARDS) is among the most common causes of influenza-related morbidity and mortality. Herein we present the case of a boy with a genetic disorder who recovered from influenza-related ARDS. A 3-year-old boy with 3p deletion syndrome was admitted for refractory cough and fever. During his follow-up, sudden respiratory failure concomitant with ARDS occured. He was transferred to the pediatric intensive care unit (PICU) and intubated. Broad-spectrum antibiotherapy and oseltamivir were administered. Nazopharnygeal swab polymerase chain reaction (PCR) analysis revealed H1N1. Venitalition parameters were set according to that recommended for ARDS. On the ninth day of his admission, the patient was discharged from PICU. Appropriate ventilation strategies together with early oseltamivir therapy improves outcomes of influenza-related ARDS.

Keywords: Influenza, acute respiratory distress syndrome, oseltamivir

Introduction

Influenza virus, mainly the H1N1 type, presents with various types of respiratory system involvement and may lead to acute respiratory distress syndrome (ARDS). Patients with neurogenetic disorders are more prone to complications of influenza because they have diminished lung capacity secondary to decreased muscle tone, detoriation of innate protective mechanisms of the respiratory tract, immunosuppression caused by malnutrition, and comorbid congenital defects (1). Chromosome 3p deletion syndrome is a rare chromosomal abnormality that occurs at the end of the short arm of chromosome 3 (2). Clinical features depend on the exact size and location of the deletion, but most common features are low birth weight, microcephaly, trigonocephaly, hypotonia, psychomotor and growth retardation, ptosis, telecanthus, downslanting palpebral fissures, micrognathia, and feeding problems. The incidence of congenital heart disease and renal abnormalities is also increased. Respiratory failure is the most common cause of morbidity and mortality in such patients. We hereby present the case of a boy with 3p deletion syndrome who recovered from ARDS secondary to H1N1.

Case Report

A 3-year-old male patient presented to our Pediatric Emergency Unit with a history of refractory cough and fever for a duration of 5 days. He had bilateral fine crackles on auscultation and pneumatic infiltrations on chest radiography (Figure 1). He was born to a first-cousin marriage with a 3p deletion syndrome. He had been admitted to the hospital several times and once to the pediatric intensive care unit (PICU) because of aspiration pneumonia. The patient was internalized to the Infectious Disease Inpatient Service with a diagnosis of pneumonia and was administered ceftriaxone. On the fourth day of admission, acute respiratory failure occurred, and he was transferred to PICU. He had a fever of 39°C, and his respiratory rate was 40/min with intercostal and subcostal retractions. Bilateral fine crackles were heard on auscultation. The results of cardiovascular examination and echocardiographic test were normal. He was intubated because of hypoxemic respiratory failure and was ventilated with synchronized intermittent mandatory ventilation pressure support mode. Chest radiography showed diffuse bilateral ground-glass opacities in the lung parenchyma (Figure 2a). The partial pressure of arterial oxygen / fraction of inspired oxygen PaO_2/FiO_2 ratio was <100, which was in concordance with ARDS.

Laboratory examinations revealed bicytopenia together with slightly increased leukocyte count [white blood cell count, 13410/mm^3 (65% neutrophils, 30% lymphocytes); hemoglobin, 8.5 g/dL; platelet, 102900/mm^3]. Results of the routine blood chemistry tests were within normal limits. C-reactive protein level was 85 mg/L (normal, <5 mg/L), and procalcitonin level was 0.5 ng/mL

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(normal, <0.05 ng/mL). He was started on broad-spectrum antibiotherapy, including piperacillin–tazobactam (200 mg/kg/day) and teicoplanin (10 mg/kg/day). Fentanyl and midazolam infusions were initiated for sedation. Because effective ventilation could not be achieved, rocuronium was administered for neuromuscular blockade. Acute onset of respiratory failure raised the suspicion of possible influenza virus, and the patient was started on oseltamivir therapy on the same day of PICU admission.

Bronchoalveolar lavage fluid was negative for acid-fast bacilli. Ventilator parameters were set to positive end-expiratory pressure (PEEP) of 10 cmH_2O, positive inspiratory pressure of 29 cmH_2O, and respiratory rate of 38 bpm. The patient was intermittently switched to the prone position. Intensive respiratory physiotherapy and timely suctioning was performed. The patient was started on meropenem instead of piperacillin-tazobactam because of persistent fever. Computed tomography of the chest was in concordance with ARDS (Figure 2b). Enteral feeding was administered over percutaneous endoscopic gastrostomy tube and was gradually increased in amount. Negative fluid balance was targeted. He was administered erythrocyte suspension because of anemia. Nasopharnygeal swab sample polymerase chain reaction analysis (Fast-track Diagnostics Ltd. Malta, Qiagen, Germany) was positive for H1N1. A seven-day course of oseltamivir was administered. On the seventh day of admission, his chest X-ray showed significant improvement (Figure 3). Ventilation parameters were gradually reduced, and he was extubated on the ninth day. After extubation, respiratory physiotherapy was performed every 3 h. On the 11th day of admission, the patient was discharged from PICU. Written informed consent was obtained from the patient's parents.

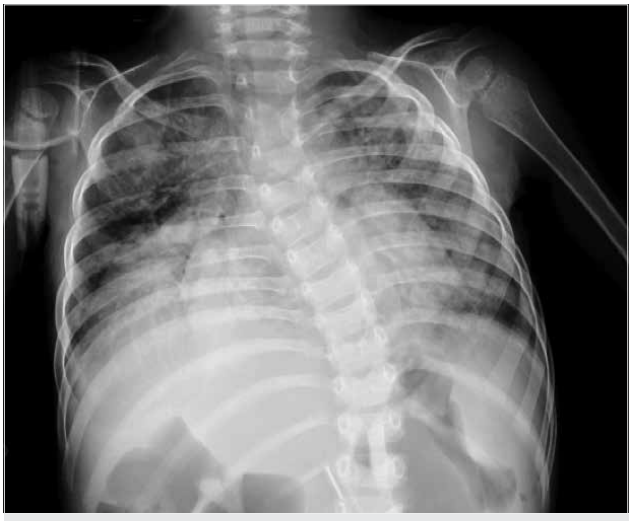

Figure 1. Chest X-ray on admission

Discussion

Acute respiratory distress syndrome is an acute inflammatory syndrome, which has a high mortality rate worldwide. Diffuse alveolar damage, increased vascular permeability, and injury to the source of surfactant results in hypoxemia. The identified risk factors for ARDS are sepsis, aspiration of gastric contents, trauma, pneumonia, fractures, and disseminated intravascular coagulopathy, but there are insufficient data to evaluate age-dependent differences in the pathophysiology (3-5).

Influenza infections during childhood usually present as mild upper respiratory tract disease, but severe complications like ARDS can also occur, especially in patients with underlying chronic conditions. According to H1N1 pandemic influenza data, 0.3% of the population developed H1N1-related illness and were hospitalized and 20% of hospitalized patients required ICU care (6). It has also been reported that among PICU admissions, neurological disorders were the most common chronic diseases (7). Chronic pulmonary disease, preterm birth, cardiac malformations, obesity, genetic disorders, and immunocompromising conditions constitute the other causes. Similarly, our patient was diagnosed with 3p deletion syndrome and had experienced several episodes of pneumonia earlier.

H1N1-related respiratory illnesses in the pediatric population include the following: viral pneumonitis; exacerbations of asthma or chronic pulmonary disease; and exacerbations of other underlying diseases, such as congestive heart failure, secondary bacterial pneumonia, and croup/bronchiolitis. Among those, viral pnuemonitis is the most common cause of ICU admission (5). The majority of these patients presented with rapidly progressive hypoxemia and bilateral alveolar infiltrates on chest radiograph, which were consistent with ARDS (8). For the definition of ARDS, symptoms of hypoxemia must occur within 7 days (9). Chest imaging findings of new infiltrates must be consistent with acute pulmonary parenchymal disease, and oxygenation index (OI) or PaO_2/FiO_2 (P/F ratio) must reveal hypoxemia. OI is preferred for patients treated with invasive mechanical

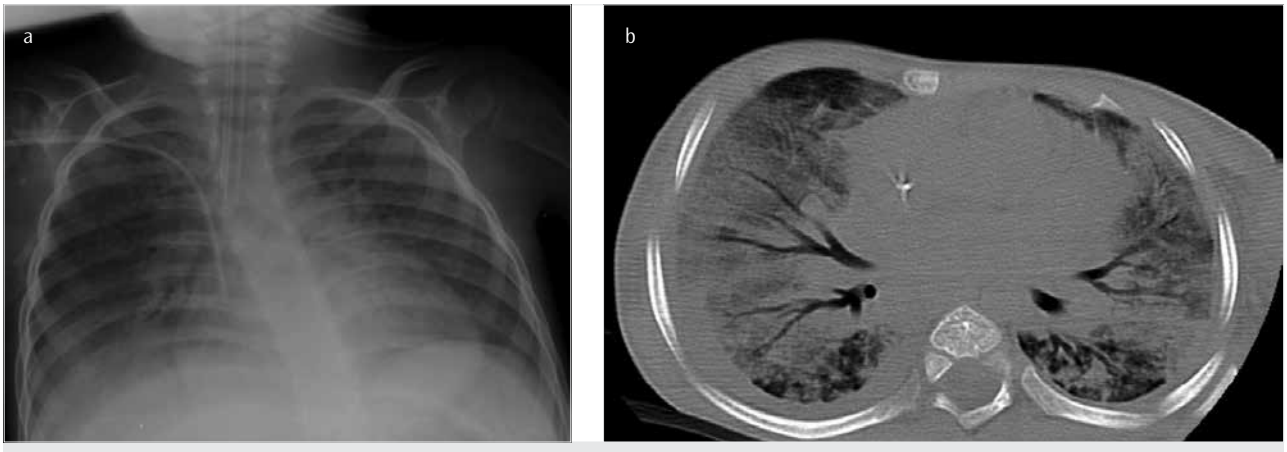

Figure 2. a, b. Results of chest X-ray (a) and chest computed tomography (b) consistent with ARDS

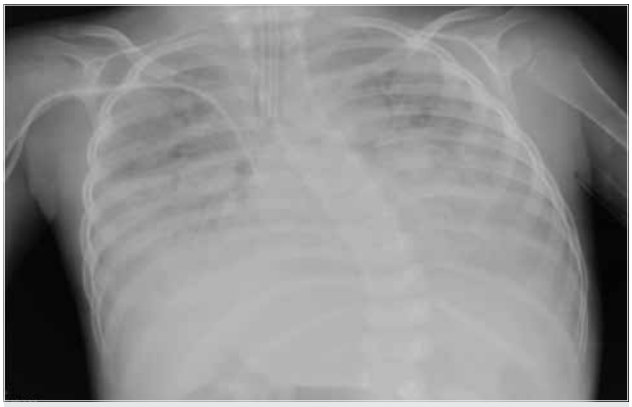

Figure 3. Chest X-ray on the seventh day of treatment

ventilation. For treatment of ARDS, higher PEEP levels, lower tidal volume, and permissive hypercapnia are targeted. This combination has been shown to be effective in optimizing lung recruitment and limiting barotrauma, with improved survival (3, 5, 10). In our patient, we also preferred higher PEEP levels, which were titrated to achieve arterial oxygen saturation between 88–97 mmHg. The maximum PEEP and tidal volume applied to our patient were 10 cmH_2O and 8–10 mL/kg, respectively. Although high-frequency ventilation is not mandatory, chest physiotherapy and neuromuscular blockade are recomended if necessary (3). Therefore, we performed routine chest physiotherapy and neuromusculer blokade and supplied ventilation with syncronized pressure support mode in our patient. Although it is not routinely recommended, we peformed intermittent prone positioning and achieved effective ventilation. The influence of prone position on the improvement of oxygenation is unclear. It may recruit the dorsal regions of the lungs, which remain atelectatic in supine position and may also optimize removal of secretions and postural drainage (11).

In our patient, we used empiric broad-spectrum antibiotics because of the high levels of infection markers, and oseltamivir phosphate was added to the treatment on the second day of admission. A meta-analysis has demostrated that early oseltamivir treatment (within 2 days of symptom onset) compared with later oseltamivir treatment was associated with a reduction in the mortality risk (12). Oseltamivir treatment was initiated in our patient before the nasal swab results were obtained. We believe that our patient's early recovery with the exception of all other supportive treatments was related to this early antiviral medication.

Conclusion

Influenza-related ARDS can lead to increased morbidity and mortality. Appropriate ventilation strategies together with early antiviral treatment improves outcomes.

Informed Consent: Written and verbal informed consent were obtained from the patient' parents who participated in this study.

Peer-review: Externally peer-reviewed.

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