Case report

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스테로이드 치료중 심한 A형 독감 (H1N1)에 걸린 신증후군 환아 1례

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A Case of Severe Influenza Infection in a Child with Nephrotic Syndrome on Steroid Therapy

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Infection is the most important cause of death in children with nephrotic syndrome. Influenza viral infections can be fatal for these children, given the annual outbreak of this virus, with the mortality rate being similar to that of respiratory syncytial virus in healthy children. Pneumonia is recognized as the most important complication of influenza infections, as it is associated with high death rates. However, the influenza vaccine, as well as antiviral agents, can be used for prevention and treatment. Therefore, aggressive management with influenza vaccination and antiviral agents will lower the overall mortality rate in children with nephrotic syndrome. Here we report the case of a 7-year-old boy with nephrotic syndrome and influenza A virus (H1N1) pneumonia.

Key words: Influenza A virus, Nephrotic syndrome, Child

Introduction

Children with idiopathic nephrotic syndrome (NS) are at increased risk of infection because of the following factors: reduced serum concentration of immunoglobulins, impaired ability to make specific antibodies, decreased levels of the alternative complement pathway factors B and D, and immunosuppressive therapy [1-3]. Infection is the most important cause of death in children with NS [4]. Viral infections, especially varicella, as well as bacterial infections, including *Pneumococcus*, *Staphylococcus*, *Haemophilus*, and *Escherichia coli*, may be life threatening in these children [5]. The influenza virus can be fatal in these children because an influenza outbreak occurs every winter season and has a mortality rate similar to that of respiratory syncytial virus in healthy children [6]. Influenza vaccination and aggressive treatment of influenza infection with antiviral

agents can decrease mortality rates in children with NS. Here we report on a 7-year-old boy with NS associated with influenza A virus (H1N1) pneumonia.

Case report

A 7-year-old boy visited our clinic because of a 1-day history of high fever and mild dyspnea. Mild productive cough and sputum, rhinorrhea, and 2 vomiting episodes were noted. A few days before the onset of the patient's illness, his younger brother had a high fever and mild cough. The patient's medical history included a diagnosis of idiopathic NS at age 3 years. He responded well to steroids and relapse was infrequent. Booster injection of pneumococcal vaccine was administered. The most recent relapse occurred 1 month before admission, and the patient was taking deflazacort, 4 tablets every other day. The patient did not receive an influenza vaccination this year. Vital signs were as follows: blood pressure, 113/78 mmHg; heart rate, 140 beats/minute; respiratory rate, 37 breaths/minute; and body temperature, 39.6℃. He was slightly dyspneic with mild subcostal retraction. His pharynx was injected. Auscultation revealed mild wheezing at the end of expiration and crackles on the left lower lung field. Pitting edema was not present on the legs. Laboratory findings were as follows: pH, 7.43; PCO_2, 30.1 mmHg; PO_2, 47.5 mmHg; HCO_3^-, 19.6 mEq/L; base excess, -3.4 mmol/L; O_2 saturation, 90%; hemoglobin, 15.7 g/dL; hematocrit, 46%; white blood cell count, 30,130 cells/mm^3 (polymorphonuclear leukocytes 90%); platelet count, 338,000/mm^3, C-reactive protein, 12.02 mg/dL; erythrocyte sedimentation rate, 8 mm/h; protein, 5.7 g/dL; albumin, 3.2 g/dL; blood urea nitrogen/creatinine, 8.7/0.5 mg/dL; glutamic-oxaloacetic transaminase/glutamic-pyruvic transaminase, 30/9 IU/L; ammonia, 33 μg/dL; serum electrolytes (129-4.6-96-14.5 mEq/L); antimycoplasma antibody immunoglobulin M, negative; antistreptolysin O, negative; urinalysis, specific gravity 1.015, pH 6.0, protein-negative, red blood cell-negative, wbc- negative; posteroanterior chest radiograph (chest PA), pneumonia in the left lower lung field; left decubitus (chest PA), pleural fluid in the left hemithorax (Fig. 1A, B). Influenza reverse transcriptase-polymerase chain reaction test (nasopharyngeal swab) showed a positive result for influenza A and H1N1.

Oxygen with a mask (2 L/min), intravenous antibiotics (vancomycin, ceftriaxone, clarithromycin), and oral oseltamivir (120 mg/day) were administered as soon as the patient was admitted. After admission, the patient exhibited aggravating irritability, inappropriate response to commands, and inappropriate speech even though his arterial blood gas analysis was as follows: pH, 7.37; PCO_2, 40 mmHg; PO_2, 113.8 mmHg; HCO_3^-, 22.8 mEq/L; base excess, -2.2 mmol/L; and O_2 saturation, 97%. Thereafter, the patient was transferred to the intensive care unit. His irritability, agitation, and noncompliance with commands were so intense that an appropriate neurological examination could not be performed. Results from all items tested during CSF examination, including influenza A, were negative. On the second hospital day (HD), he became extremely calm, and was conscious even though intermittent fever and mild dyspnea persisted. Electroencephalography (EEG) revealed possible nonspecific cerebral dysfunction and partial seizure. Brain magnetic resonance imaging (MRI), including diffusion MRI, revealed normal findings. Fever and dyspnea subsided without use of mechanical ventilation on the third HD. Pneumonic infiltrations on chest PA grew stronger and weaker until the fourth HD (Fig. 1C, D, E), and then improved clearly when the patient was discharged on the eighth HD (Fig. 1F). Follow-up EEG was normal.

Discussion

Influenza A virus (H1N1), also known as swine flu, pandemics first occurred in 2009, and thereafter its outbreak occurred seasonally. The World Health Organization reported that among patients presenting with acute respiratory symptoms in Mexico, which was the first country to show the effects of the epidemic caused by this virus, 13% tested positive for influenza A (H1N1) virus infection, of whom approximately 10% have been hospitalized and one-third of those hospitalized required mechanical

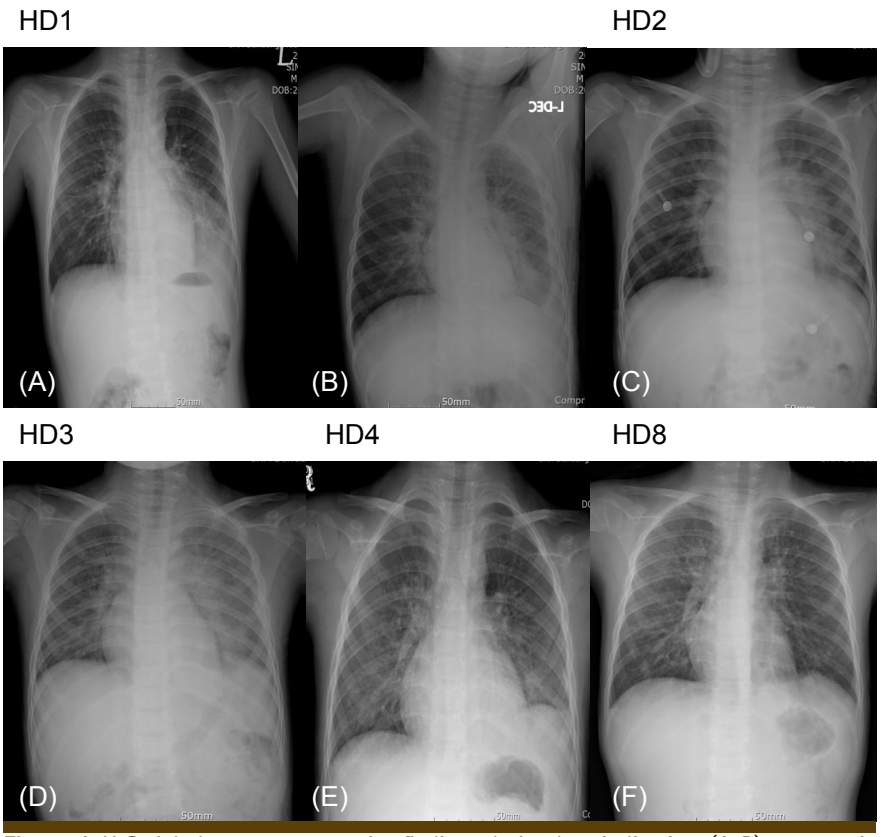

Fig. 1. A-H Serial chest posteroanterior findings during hospitalization. (A-B) pneumonic consolidation in left lower lung field and pleural effusion in left hemithorax at admission, (C-E) wax and waning, but improving pneumonia at the 4th hospital day, (F) improved pneumonia at the 8th hospital day.

ventilation in 2009 [7]. The mortality rate of the 2009 influenza A (H1N1) virus was approximately 0.4% worldwide [8]. Most of the deaths caused by the 2009 influenza A (H1N1) virus were in younger people [7]. Its complications included severe pneumonia, acute respiratory distress syndrome, rhabdomyolysis, acute myocarditis, and encephalopathy [9].

Pneumonia was recognized as the most important complication of influenza infections associated with high death rates [10]. Pneumonia in patients with influenza may be caused directly by viral invasion or result from bacterial complications. However, bacterial pneumonia complicating influenza usually occurred after near-resolution of influenza symptoms; therefore, bacterial coinfection played a minor role as a cause of pneumonia in these patients [10]. Its predominant radiologic pattern on chest radiographs was multilobar consolidation [10].

Systemic glucocorticoid therapy is associated with a dose dependent increase in the risk of infection in children with NS [11]. During high-dose glucocorticoid therapy, there is an immediate risk of infection due to dose dependent inhibitory effects on phagocytic cell function [11]. With long-term low-dose use, there may be some inhibition of adaptive immune responses with increasing duration of therapy [11].

Two notable findings from this case were the rapid progression of pneumonia and symptoms mimicking encephalopathy caused by influenza A (H1N1) virus infection, and rapid clinical improvement with antiviral agent treatment even though the patient was a young child with NS taking an immunosuppressive agent.

In conclusion, annual influenza vaccination is necessary in children with NS. Rapid administration of an antiviral agent in children with NS complicated by influenza viral infection can prevent rapid disease progression and fatality.

요약

신증후군 환아에서 감염은 매우 중요한 사망원인이 된다. 독감 바이러스는 매번 겨울철마다 유행하며, 독감 바이러스의 치명률은 건강한 소아에서 호흡기세포융합바이러스의 사망률과 비슷하므로 독감에 의한 감염도 신증후군 환아들에게는 매우 치명적일 수 있다. 독감에 의한 사망률에는 폐렴으로 인한 사망이 많은 부분을 차지한다. 하지만, 독감은 예방접종과 항바이러스 치료제가 존재하므로 치료 및 예방이 가능하다. 그러므로, 적극적인 독감 예방접종과 항바이러스 치료는 신증후군 환자들에게서 치명률을 낮출 수 있을 것으로 생각된다. 저자들은 신증후군 치료중에 A형 독감(H1N1)에 의한 폐렴에 걸린 7세 남아를 경험하였기에 보고하는 바이다.

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