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Case report

H1N1 with fatal viral septicemia in a normal child: A case report

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A B S T R A C T

Background: Regardless of the agent, the inflammatory response is interconnected with infection. Mostly the initial response to infection is severe sepsis and characterized by a pro-inflammatory state, which then progresses to an anti-inflammatory state that develops and favors secondary infections (Florescu and Kalil, 2011) [1]. T-helper 1 (Th1) cells activated by microorganisms increase transcription of pro-inflammatory cytokines such as tumor necrosis factor (TNF-α), interferon-γ (INF-γ), and interleukin-2 (IL-2) (Hotchkiss and Karl, 2003; Brown and Jones, 2004; Russell, 2006) [2–4]. Different cytokines, TNF-α, interleukins, lymphokines, monokines, IFN-γ, colony-stimulating factor (CSF) and transforming growth factors, released from endothelial cells and subsequently from macrophages can induce lymphocyte activation and infiltration at the sites of infection and will exert direct antiviral effects. Subsequently, with the shift toward an anti-inflammatory state, activated T-helper 2 (Th2) cells secrete interleukin-4 (IL-4) and interleukin-10 (IL-10) (Hotchkiss and Karl, 2003; Russell, 2006) [2,4]. Sometimes, T cells can become anergic and fail to proliferate as wells producing cytokines (Hotchkiss and Karl, 2003) [2]. Type I IFN has a potent anti-influenza virus activity, it induces transcription of several interferon-stimulated genes, which in turn restrict viral replication (Garcia-Sastre, 2011) [5]. However, the influenza virus developed several mechanisms to evade IFN response as NS1 protein, IFN-antagonist produced by the virus, PB1–F2 proteins that inhibit IFN induction, the viral polymerase inhibits IFN function, and M2 protein prevents toll-like receptor (TLR) induction (Garcia-Sastre, 2011) [5].
Influenza virus can also trigger the deregulation of the innate immune system with excessive cytokines release leading to potentially harmful consequences (Teijaro et al., 2011) [6]. Abnormal immune response to influenza can lead to endothelial damage through the remodeling of the cellular cytoskeleton, loss of intercellular junctional integrity, cellular apoptosis, deregulation of coagulation, the consequent alteration of microvascular permeability, tissue edema, and shock (Steinberg et al., 2012) [7]. This increase in permeability of the endothelium is mainly due to the intercellular pathways and to a lesser extent through the transcellular leak (Steinberg et al., 2012) [7]. Such vascular hyperpermeability and multi-organ failure with severe edema, shock, acute lung injury, and even acute encephalopathy have been described in severe influenza infections (Wang et al., 2010; Armstrong et al., 2013) [8,9]. Novel drugs and vaccines such as peramivir, baloxavir marboxil, and 4 egg-based quadrivalent inactivated influenza vaccines have been added recently [10]. These changes require better and more efficient diagnostic and therapeutic approaches to avoid a fatal progression. I would like to report a child patient with H1N1 influenza, who developed rapid fatal viral septicemia.

1. Case presentation

A three-year-old normal male child with no significant medical history came to the outpatient clinic at Children's Hospital, Ain-Shams University after 2 days of low-grade fever 37.8°c and symptoms of upper respiratory tract infection in the form of sneezing and rhinorrhea with a good appetite and no signs of respiratory distress.

Two days later, the child developed mild respiratory distress so he was admitted to the hospital. The examination on admission at 5 p.m.: temperature 38°c, pulse 130 bpm, respiratory rate 45 with no signs of retractions and blood pressure 110/60. The chest examination revealed a bilateral decrease in air entry with scattered sibilant and sonorous rhonchi. Heart, abdomen and neurological examinations were free.

Initial laboratory data were: CBC Hb 11g/dl, PLT 250,000, TLC 3000 with lymphocytes 23%, CRP negative, ABG PH 7.34, PCO2 45 mmHg, PO2 90 mmHg, HCO3 22 mmol/l and normal kidney and liver functions. Patient O2 saturation was 95% on room air. Initial cultures were withdrawn before starting treatment. According to the hospital policy, a viral swab was sent for PCR. The initial X-ray showed a right para-hilar consolidation. Fig. 1.

The initial medication was started as oseltamivir 3mg/kg twice daily and amoxicillin 25mg/kg every 8 hours beside the inhalation of salbutamol 2.5 mg every 6 hours.

At 10 p.m., the patient suddenly developed severe respiratory distress, respiratory rate was 68 with intercostal and subcostal retractions and audible grunting. His vital data was: HR 180 bpm and blood pressure 110/70. Therefore, a decision was made to put him on nasal oxygen with 2 L then he was transferred to the PICU.

At 11:45 p.m., the condition deteriorated more and more, RR 78, HR 190 bpm, ABG PH 7.18, PCO2 60 mmHg, PO2 70 mmHg, HCO3 18mmol/l. The patient was irritable, and O2 saturation was 90% on 5 L oxygen. So endotracheal intubation was introduced, and the patient was ventilated on assist control PIP 17, PEEP 7, RR 40, FIO2 50%. A new X-ray was done showing acute respiratory distress syndrome (ARDS) with

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bilateral total white lung. Fig. 2.

Lung recruitment was done, yet the lung condition was deteriorating as the patient needed very high PIP 30, PEEP 15, FIO2 100% to achieve a saturation of 80% (our institute does not have HFOV nor ECMO).

During this period, his random blood sugar was elevated 340 mg/dl with stress hyperglycemia and his heart rate was 200 bpm with a galloping rhythm and his blood pressure was 90/60 with cold extremities, so epinephrine 0.1 μg/kg/minute infusion was added to maintain his blood pressure and dopamine 10 μg/kg/minute.

Cardiac enzymes were withdrawn at midnight showing troponin of 2ng/ml, CPK 500 IU/l.

At 2 a.m., the patient had a cardiac arrest in the form of asystole and 5 cycles of cardio-pulmonary resuscitation (CPR) was performed. Again, at 4 a.m., the patient developed a frank pulmonary hemorrhage and arrested. 20 minutes of CPR was done, yet the heart rate was not resumed again, so death was announced at 4:30 a.m.

Cultures were negative for bacterial growth. PCR for virology was positive for H1N1.

2. Discussion and conclusions

We evaluated and recorded the epidemiological and clinical data, laboratory findings and treatment protocol for the patient starting from his admission. The patient was 3 years old which is a common age group for H1N1. According to Chaitanya et al. most H1N1 infected patients (66.66%; n = 24) were between 1 and 6 years, and 22.22% were over 6 years with a mean age of 5.2 years [11]. In another study, the median age for eighty pediatric in-patients was 41.9 months [12].

The patient had some common H1N1 symptoms such as fever, cough and, rhinorrhea which were mentioned in other studies, these symptoms were fever (100%), cough (88.88%), rhinorrhea (83.33%), vomiting (22.22%) and loose stools (22.22%) [11]. Biçer et al. stated the same previous symptoms [13].

The patient mentioned in this report had initially a consolidation in his X-ray compared to the other X-ray findings in another study on 17 cases, which found peribronchovascular opacity (29.0%), Consolidation (17.6%), and nonspecific alveolar opacities (11.8%). Multiple or concomitant abnormalities were seen in seven patients (41.2%). The changes were bilateral in 11 (64.7%) and asymmetric in 13 (76.5%) [14].

There was no history of bacterial infections and confirmed by labs and cultures. However, Chaitanya et al. mentioned that secondary bacterial infection was found in 16.66 [11].

According to the patient's situation and the recent guidelines, oseltamivir, amoxicillin, and salbutamol were administrated; however, the condition deteriorated [10]. He was put on mechanical ventilation which was found also in pediatric patients studied by another study that found mechanical ventilation was required in 11% of cases during treatment [11].

The patient developed an aggressive fatal onset of ARDS and viral septicemia with multi-organ failure. The result was similar to Pariani et al. study with a case fatality rate of 11.3% [15].

Inflammatory responses that are triggered by a severe influenza infection is a double-edged sword. It either can eliminate the infection, or may result in poor outcomes. Influenza virus, like other viruses, displays significant interaction with the immune system, which can directly lead to severe sepsis, septic shock as well as multi-organ failure or to a secondary bacterial infection. Influenza viruses require substantial more basic and clinical research to improve today's diagnostic and therapeutic challenges.

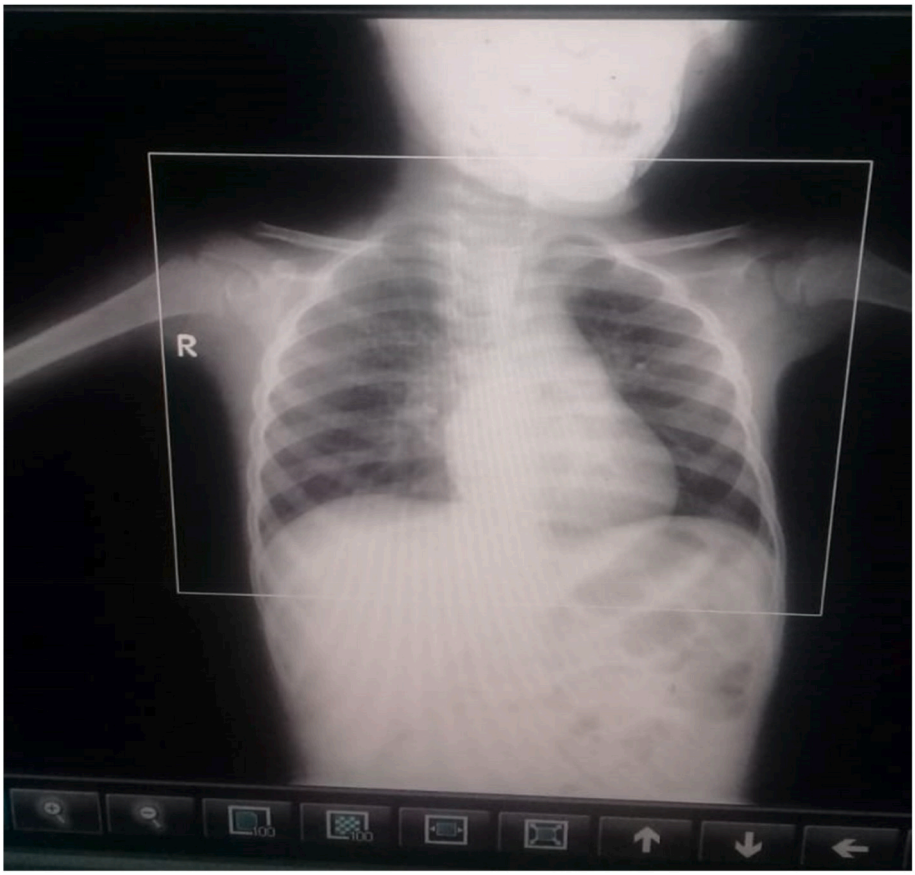

Fig. 1. Right lung middle para-hilar consolidation.

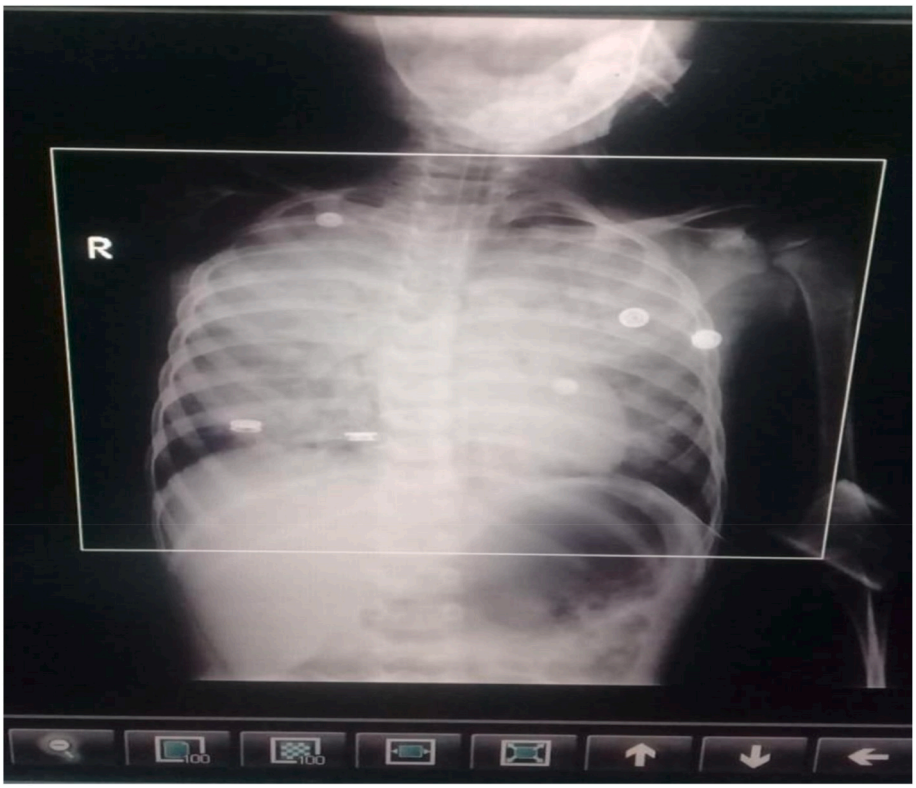

Fig. 2. Bilateral total white lung.

3. Ethical approval and consent to participate

Informed consent was obtained from the patient's parents on each diagnostic and therapeutic intervention.

4. Consent for publication

Written informed consent was obtained from the patient's parent for publication of this Case report and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

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Authors' contributions

Not applicable.

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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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.rmcr.2020.101055.

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