Special Communication

Clinical comparison of one recovered case and one fatal case of human infection with H7N9 avian influenza in Shanghai Public Health Clinical Center in China

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Submitted: 25 May 2013
Accepted: 6 Jun 2013

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Abstract

H7N9 avian influenza is the latest subtype of influenza virus to emerge in the world. By April 17, 2013 in Shanghai, a total of 31 confirmed cases were reported, and 11 of these patients died. The epidemiological characteristics and the clinical progress of this new human flu infection are still not clear. Thirteen confirmed patients have now been treated in Shanghai Public Health Clinical Center. Among the first batch of patients, hospitalised at the beginning of April 2013, two who were admitted with the same estimated date of onset of disease had very different outcomes. After active treatment at the Centre, one recovered by April 18, 2013, but one patient entered critical condition and died on April 11, 2013. The clinical and laboratory characteristics in hospital are here analysed and compared to learn more about H7N9 avian influenza. Confirmation that the observed differences are valuable for prognosis and treatment decisions for H7N9 patients awaits authentication by analysis of more patients.

Keywords: *H7N9, avian influenza, infectious disease, clinical, laboratory, characteristics*

H7N9 avian influenza is a new subtype of influenza virus which emerged in China. By April 17, 2013 in Shanghai, a total of 31 confirmed cases were reported, and 11 patients had died. Because of the multiple cases, severity, and high fatality rate of this disease, it attracted high attention not only domestically but also worldwide. However, because it is a new type of flu virus, its epidemiological characteristics and the clinical progress of human infection are still not clear. As the hospital designated to admit and treat the patients infected with H7N9 avian influenza in Shanghai, this hospital has now confirmed and treated 13 patients. After active treatment, one of the patients hospitalised in the first batch (hereinafter referred to as Case 1) was classed as recovered on April 18, 2013; while another (hereinafter referred to as Case 2) died on April 11, 2013 after entering a critical condition. We compare these two clinical experiences now in the hope that analysis is informative for future treatment of this new infectious disease.

The clinical features of the 2 patients

During the six days before confirmation of H7N9 infection, the two patients developed flu-like symptoms such as fever, cough and so on. Prior to hospital admission, doctors obtained lung images that indicated lung infection and anti-infection drugs (including antibacterial and antiviral drugs, oseltamivir) were given as treatment. Basic situation as shown in the Table 1.

Case 1

General situation on admission was that oxygen saturation was being maintained at around 95% using 5 l/min nasal catheter suction. Admitting diagnosis: viral pneumonia (H7N9 mild), hypertension, gout. The condition of the patient improved markedly after admission to hospital and treatment with antiviral oseltamivir (tamiflu), antibacterial (moxifloxacin), and inflammation suppressive hormonal agents. Body temperature dropped to normal and lung computed tomography (CT) showed the inflammation had reduced significantly. Then two consecutive pharyngeal swab tests of H7N9 virus nucleic acid were negative, facilitated discharge from hospital.

Case 2

General situation on admission was that a noninvasive ventilator was maintaining oxygen saturation at about 95%, and a continuous dopamine intravenous drip was keeping blood pressure stable. Admitting diagnosis: viral pneumonia (H7N9 severe), acute respiratory failure, coronary heart disease (CHD), cardiac function grade, and renal insufficiency. After patient admission to hospital, the condition was usually poor and lung infection control was not ideal, probably because of the substantial combined load of underlying diseases. After six days in hospital with the aggrevation of respirator assisted ventilation endotracheal intubation was performed, but the rescue failed, and the patient died two hours after endotracheal intubation.

The characteristics of laboratory examination of the two cases with the outcomes of so dissimilar, it is relevant that laboratory examination also showed very large difference in some tests (Table 2).

Pulmonary imaging characteristics of the two cases

Before admission to hospital, the two cases had all undergone lung imaging examination, but the scope and degree of lung inflammation and pathology were not all the same.

Case 1

Chest CT on April 6, pre-admission

Obvious lung inflammation was seen in the left lower lobe and right upper lobe of the lung and considered to probably be viral pneumonia, There was pleural effusion on both sides.

Case 2

Chest CT on April 5, pre-admission

Two large lung inflammation zones.

Discussion

Avian influenza (bird flu) is caused by a virus that is usually highly species-specific, infecting birds, and sometimes pigs. However, on rare occasions after natural genetic recombination between different strains, a new strain is formed that can also cross the species barrier to attack humans. Since the discovery in Hong Kong in 1997 that humans can be infected with lethal bird flu, this infectious disease has received close attention from the World Health Organization. This report concerns human infection with H7N9 avian influenza virus, which is essentially a new virus, with substantial elements coming from H9N2 avian influenza virus.

The source of the infectious disease is not yet clear, although there is strong suspicion that the source may be poultry and their secretions or feces that carry H7N9 avian bird flu virus. Case 2 raised poultry, but Case 1 had no clear contact.

By following the progression of observations made after admission to hospital, we can see that some significant differences in laboratory examination indexes existed:

1. although the white blood count counts of the two cases were normal or lower, the percentage of neutrophils of Case 2 was significantly higher than normal all the time, while in Case 1 the count was returning to normal levels during treatment;
2. lymphocyte absolute value in Case 2 was significantly lower than normal, while in Case 1 the index also gradually returned to normal levels;

Table 1: Basic information of the two cases

	Case 1	Case 2
Gender	Male	Male
Age	65	74
Date of Onset	March 31, 2013	March 31, 2013
Confirmed Date of infection with H7N9	April 6, 2013	April 6, 2013
Date of use oseltamivir	April 4, 2013	April 5, 2013
Contact History	Unclear poultry exposure history	Raising chickens at home
Complications	Gout, High blood pressure	Coronary Heart Disease (CHD)

Table 2: Laboratory test results of the two cases

	Case 1	Case 2
Treatment outside the hospital		
WBC (×10⁹/l)	3.5	5.5
N (%)	72.4	79.6
Treatment in hospital		
WBC (×10⁹/l)	3.74	5.41
NEUT (%)	76.7	90.3
LYMPH (%)	18.2	6.7
NEUT# (×10⁹/l)	2.87	4.89
LYMPH# (×10⁹/l)	0.68	0.36
C-reactive prolein (mg/L)	10.8	93.8
ALT (U/L)	39	20
AST (U/L)	77	86
TBIL (umol/L)	4.6	5.6
Urea (mmol/L)	3.23	16.2
Creatinine (umol/L)	74.3	159.6
H7N9 nucleic acid test	Positive	Positive
The second day after hospitalisation		
WBC (×10⁹/l)	3.54	5.25
NEUT (%)	74.9	88.8
LYMPH (%)	17.2	8
NEUT# (×10⁹/l)	2.65	4.66
LYMPH# (×10⁹/l)	0.61	0.42
ALT (U/L)	28	20
AST (U/L)	61	76
TBIL (umol/L)	7.9	6.5
Urea (mmol/L)	3.67	19.64
Creatinine (umol/L)	65.5	166.9
The sixth day after hospitalisation		
WBC (×10⁹/l)	5.2	14.66
NEUT (%)	63.8	93.4
LYMPH (%)	23.5	2.7
NEUT# (×10⁹/l)	3.32	13.7
LYMPH# (×10⁹/l)	1.22	0.4
ALT (U/L)	37	22
AST (U/L)	30	72
TBIL (umol/L)	13	11.9
Urea (mmol/L)	2.77	14.92
Creatinine (umol/L)	70.8	142.9
H7N9 nucleic acid test	Negative	Positive

Abbreviation: WBC = white blod cell, NEUT = neutrophil, LYMPH = lymphocyte, ALT = alanine transaminase, AST = aspartate aminotransferase, TBIL = total bilirubin.

3. In Case 2, renal function appeared to be abnormal, but there was no apparent kidney damage in Case 1;
4. C-reactive protein was significantly elevated in both cases, but higher in Case 2.

Whether these differences in the laboratory examination indexes between the 2 patients are useful for the prompt management or for the prognosis of H7N9 patients remains to be established.

The results of H7N9 nucleic acid testing with pharyngeal swabs are also different for the two patients. Case 1 tests showed negative after six days in hospital, while Case 2 still showed positive. The difference might imply that when the H7N9 virus in the body has not been controlled effectively the patient's condition is likely to get worse. For such patients, we can consider whether to use other antiviral drugs to enhance the antiviral effect.

Accompanying the completely different outcomes in the 2 patients we see some clinical similarities and differences. Confirmation that these differences provide a valuable guide to treatment or prognosis awaits analysis of further cases.

Acknowledgment

We thank the Department of Emergency Response, Shanghai Public Health Clinical Center, for providing data and thank all the doctors and nurses stationed in the infectious disease ward day and night to fight against the H7N9 outbreak.

Conflict of Interest

None.

Fund(s)

None.

Authors' Contributions

Conception and design: HZL
Analysis and interpretation of the data: SH, YBW, XL
Drafting of the article: QZ, DL, YC, YFZ
Critical revision of the article for the important intellectual content: HZL, DL
Final approval of the article: HZL, YFL
Provision of study materials or patient: YFZ, XHX, ZQ

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