

Research article

Clinical imaging research of the first Middle East respiratory syndrome in China

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Abstract

Middle East respiratory syndrome is a viral respiratory illness caused by a novel human beta-coronavirus. Based on the first case of Middle East respiratory syndrome found in China, a clinical research in combination with radiological findings was studied. Fever was the main clinical manifestation of this patient, and the primary imaging findings were basically the same as viral pneumonia. Differential imaging diagnosis on the basis of epidemiological and experimental pathogen detection is helpful for clinical diagnosis of MERS, even in distinguishing from SARS and pneumonia caused by H7N9 avian influenza.

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Keywords: Middle East respiratory syndrome; Imaging; Infection

1. Introduction

Middle East respiratory syndrome (MERS), also known as camel flu, is a viral respiratory illness caused by a novel human beta-coronavirus (CoV) [1–3]. Since it was firstly reported by Saudi Arabia in September 2012, till June 2015, more than 1200 patients have been detected worldwide, with at least 427 cases of patients died [4,5]. Until June 2015, most of the cases of MERS-CoV infectors occurred in the Middle East, and recently, it is reported that South Korea has been suffering from MERS. Symptoms may range from mild to severe, including fever, cough, diarrhea, and shortness of breath. Although the exact route of transmission is still unclear, the respiratory droplet route is currently most likely [6]. Although a few cases were reported in other

countries, one was found in China in May 2015. A clinical research in combination with radiological findings was studied.

2. Materials and methods

2.1. Case history

A male Korean patient, born in 1971, had a close contact with his father who was diagnosed as the Middle East respiratory syndrome. He began to appear back pain on May 21, 2015, without fever, cough and sputum. No special treatment was given. He had a fever on May 25, 2015, with body temperature up to 39.7 °C, no chills, no cough, sputum, no shortness of breath, no abdominal pain, no diarrhea, and no sore throat. Cold medications were ineffective. On June 26 of 2015, he arrived in Hong Kong from South Korea by flight at 12:50, and then arrived in Huizhou City from Shenzhen. At 2:00 pm, May 28 of 2015, isolation and treatment was given for him in Huizhou designated hospital. During his whole

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journey in China, there were about 75 close contactors, who were all confirmed to be healthy after the isolated ward.

2.2. Physical examination

Body temperature was 39.0 °C, blood pressure was 126/78 mm Hg, heart rate was 98 beats/min, and breathing was 21 times/min. Breath sounds were ruder for the two lungs without coarse rales, heart rate was regular, abdomen was soft, and bowel sounded normal.

2.3. Laboratory tests after hospitalization

The blood gas analysis, Biochemistry, and Blood routine examination after hospitalization were shown in Table 1 and Table 2. Pathogenic examination (sputum virological detection) showed that MERS-COV was positive on June 1 of 2015, and the result changed to negative the second day.

2.4. Imaging examination and diagnosis

Mobile DR was implemented by employing the chest semi-recumbent on May 28 of 2015 after hospitalization, followed by May 30th, June 1st, June 3rd, June 4th, June 6th and June 8th. Obviously, pneumonia of the lower lungs was the primary finding (Fig. 1).

3. Results

Patients was in fever after May 28, 2015 hospitalized, lasting about a week between 38.0 °C and 39.5 °C (Fig. 2). Then with Tamiflu and ribavirin antiviral therapy, broad-spectrum antibiotic anti-infective therapy, oxygen therapy and improve immune function with gamma globulin, the virus was negative on June 2. Low white blood cell count had been gradually increased to normal in two days after the virus was negative (Fig. 3). According to ‘cases of diagnosis and treatment of Middle East Respiratory Syndrome (2015 edition)’ by the National Health Development Planning Commission, he was discharged on June 26, 2015.

4. Discussion and conclusion

It is well-known that incubation period of MERS is 2–14 days. Clinically, acute respiratory infection is the primary

Table 2
The biochemistry, and blood routine examination after hospitalization.

Biochemistry		Blood routine examination	
ALT	24 U/L	WRC	$3.22 \times 10^9/L$
AST	57U/L	NE	2.35
AST/ALT	2.38	PLT	$81 \times 10^9/L$
CK-MB	8 U/L	RBC	$4.7 \times 10^{12}/L$
GLU	5.7 mmol/L	/	/
Urea	5.4 mmol/L	/	/
UA	308umol/L	/	/
Cr	54umol/L	/	/

performance of MERS, accompanying with high fever (even reach to 39–40 °C), and sometimes with chills, shiver, cough, chest pain, headache, muscle and joint aches, fatigue, loss of appetite and so on. On the basis of pneumonia, the MERS rapidly developed into respiratory failure, acute respiratory distress syndrome (ARDS) or acute renal failure. Diarrhea and other atypical clinical manifestations might occur to individual cases (such as immunodeficiency cases). In this study, the patient suffered from fever (up to 39.5 °C) and back pain firstly. After hospitalization for one week, his body temperature returned to normal (Fig. 2), but still being in cough with a small amount of yellow phlegm and a little bloodshot; and there is no shortness of breath at rest and oxygen therapy. On the sixth day after his hospitalization, MERS-COV was negative via the virological detection of sputum, and his body temperature had decreased to be normal, which indicated that the virus has a direct relationship with the fever. Laboratory tests found that the leukocytes count in the peripheral blood had decreased obviously since his hospitalization, and the count was about $3.00 \times 10^9/L$ lasting for nine days, followed by increasing and till the 27th days it recovered to the normal level. This indicated that MERS-CoV mainly attacked human immune system, resulting in a significant reduce of leukocytes count; after the virus was cleared, the recovery may be a relatively slow process due to the leukocytes count recovered to the normal range for about two weeks after the virus return to be negative.

The camel and bat are always thought to be the main infection source, but the animal to human infection process was not so clear till now. Generally, human to human infection should be paid more attention, for MERS-CoV would spread

Table 1
The blood gas analysis after hospitalization.

Items	Results	Items	Results
Lactic acid	1.8 mmol/L	Bicarbonate	21.4 mmol/L
PH	7.41	Extracellular base excess	–2.5 mmol/L
Partial pressure of carbon dioxide	34.4 mm Hg	Alveolar blood oxygen partial pressure	171 mm Hg
Oxygen partial pressure	72 mm Hg	BB	–2.2 mmol/L
Hematocrit	44%	Difference of alveolar-arterial oxygen pressure	99 mm Hg
Base excess	–2.0 mmol/L	a/AO ₂	41.9
SO ₂ (c)	94.5%	K ⁺	4.21 mmol/L
Cl [–]	97 mmol/L	Na ⁺	132 mmol/L

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