INTRODUCTION

Trichinosis is a food-borne zoonotic disease caused by the nematode, Trichinella spp., and had been reported several times in Korea. Recently, there was an additional outbreak, involving 5 patients, the findings from which are reported herein. On 30 November 2010, 8 persons ate sashimi of the meat of a wild boar. Then, 2-3 weeks later, they complained of myalgia and fever. Unfortunately, muscle biopsy was not performed, but ELISA was performed using their sera. Two people among 8 were positive for Trichinella on the 34th day post-infection (PI), and 3 patients who initially revealed negative ELISA were additionally proved to be positive for trichinosis on the 42nd day PI. Hence, the confirmed patients of trichinosis were 5 in total in the present outbreak. They were treated with albendazole and discharged uneventfully. This was the fifth outbreak of trichinosis in Korea.

Key words: Trichinella, trichinosis, wild boar, ELISA, outbreak

CASES RECORD

In December 2010, 2 patients were admitted to the Department of Internal Medicine, Dankook University Hospital, due to complaints of generalized myalgia, headache, and facial edema. They were living in Cheonan-si, Chungcheongnam-do, and had dinner with their colleagues on 30 November, 2010. The main dishes were barbecue and sashimi, both from the meat of a wild boar. Among the participants of the dinner, 2 patients and 6 other people ate the sashimi. Two weeks after the dinner, the aforementioned symptoms developed in the former, and they visited Dankook University Hospital. After then, the rest of the people also complained of similar symptoms, such as myalgia, fever, and headache in 10 days, and were admitted to Dankook University Hospital. The incubation period of 8 patients was 16.3 days on average (Table 1).

The laboratory findings revealed elevation of the eosinophil count in all patients (14.2-41.2%), and elevation of C-reactive protein (CRP) in 6 patients. Leukocytosis was observed in only 2 patients, and muscle enzymes, creatine kinase (CK) and lactate dehydrogenase (LDH), increased in 2 patients. ELISA using the sera of the patients was performed in the Department
Table 1. Hospital records of 8 trichinosis patients

| No. | Age/sex | Symptoms                          | Date of onset | WBC count (eosinophil; %) | Others               |
|-----|---------|-----------------------------------|---------------|---------------------------|----------------------|
| 1   | 48/F    | Generalized myalgia, headache, eyelid edema | 12.15         | 9,430 (29.6)              | CRP+                 |
| 2   | 39/M    | Myalgia, headache, fever, facial edema  | 12.15         | 4,760 (23.7)              | CRP+                 |
| 3   | 48/M    | Myalgia, fever, chill              | 12.23         | 12,510 (41.2)             | CRP+                 |
| 4   | 62/M    | Headache, myalgia                  | 12.24         | 14,770 (24.6)             | CRP+                 |
| 5   | 37/M    | Febrile sense                      | 12.25         | 4,640 (24.4)              | CRP+                 |
| 6   | 56/M    | Headache, sweating diarrhea (3 wk ago) | 12.21         | 4,930 (26.0)              | CRP+                 |
| 7   | 34/M    | Fever, myalgia                     | 12.21         | 12,720 (39.0)             | CRP+                 |
| 8   | 37/M    | Facial edema, myalgia, fever       | 12.21         | 5,130 (14.2)              | CRP+                 |

Table 2. ELISA results in sera of 8 patients

| No. | Date of serum collection | Positive control | Negative control | Patient’s ELISA titer* |
|-----|--------------------------|------------------|------------------|------------------------|
| 1   | 2011. 1. 3               | 0.346            | 0.002            | 0.026                  |
| 2   | 2011. 1. 3               | 0.346            | 0.002            | 0.097                  |
|     | 2011. 1. 11              | 0.376            | 0.005            | 0.253                  |
| 3   | 2011. 1. 3               | 0.346            | 0.002            | 0.361                  |
| 4   | 2011. 1. 3               | 0.346            | 0.002            | 0.255                  |
| 5   | 2011. 1. 3               | 0.346            | 0.002            | 0.041                  |
| 6   | 2011. 1. 11              | 0.376            | 0.005            | 0.107                  |
| 7   | 2011. 1. 3               | 0.346            | 0.002            | 0.068                  |
| 8   | 2011. 1. 4               | 0.346            | 0.002            | 0.240                  |
|     | 2011. 1. 11              | 0.376            | 0.005            | 0.267                  |

*ELISA was done in the Department of Parasitology, Seoul National University College of Medicine. The positive criterion was 0.250. Underline means positive.

Table 3. Outbreaks of trichinosis occurred in Korea

| No. | Date        | No. of patients | Infection source | Locality                                      | Diagnosis [Reference No.]          |
|-----|-------------|-----------------|------------------|-----------------------------------------------|-----------------------------------|
| 1   | December 1997 | 4               | Badger           | Geochang, Gyeongsangnam-do                   | Muscle biopsy, Ab test [10,11]    |
| 2   | February 2001 | 5               | Wild boar        | Inje-gun, Gangwon-do                         | Muscle biopsy, ELISA              |
| 3   | February 2002 | 4               | Wild boar        | Gangwon-do                                   | Muscle biopsy, PCR [12]            |
| 4   | March 2003    | 13              | Wild boar        | Inje-gun, Gangwon-do                         | Muscle biopsy, ELISA              |
| 5   | November 2010 | 8               | Wild boar        | Yanggu-gun, Gangwon-do                       | ELISA (+) in 5 patients            |

of Parasitology, Seoul National University College of Medicine on the 34th day post-infection (PI). The positive criterion of ELISA absorbance was 0.25, but only 2 serum samples were positive for T. spiralis antigen in the first ELISA. Sera collection was performed from 4 ELISA-negative patients 8 days later, and they were re-examined by ELISA for Trichinella. Among them, 3 samples were additionally proved to be positive (Table 2). Since the 2 ELISA-negative patients could not be followed-up, the confirmed cases of trichinosis were 5 in number. They were treated with albendazole for 2 weeks, and all the patients were discharged without any remaining clinical signs of trichinosis.

**DISCUSSION**

Including the first outbreak in 1997, there had been 4 reports of trichinosis outbreaks in Korea [10-13]. Since the first outbreak was separated into 2 reports, and the report on the outbreak in Inje-gun, Gangwon-do in 2001 has not yet been published, the present case is regarded the fifth outbreak in Korea (Table 3). Among the 34 Koreans diagnosed with trichinosis, only 27 could be located. Nineteen of them were males and 8 were females, with a mean age of 45.6 years. Their most common symptom was fever (27/27), followed by myalgia (25/27) and facial edema (18/27). Eosinophilia (>5%) was observed in all of them. The record of trichinosis mainly depends on consumption of the meat of domestic or wild animals, but the recognition of trichinosis by a clinician is important for detection of the outbreak. Thus, if a patient complains of myalgia and fever with eosinophilia, the doctor should consider the possibility of trichinosis. In our cases, muscle enzymes, such as CK and LDH were not always elevated, and leukocytosis was not an essential criterion of Trichinella infection (Table 1).
ed larva through a muscle biopsy [1], but such method could not be applied to each patient. Serologic tests may be helpful for the diagnosis, and ELISA using an excretory-secretory (ES) antigen is the most commonly used assay, with 99% sensitivity and 91-96% specificity [14]. In particular, ELISA has an advantage over digestion method in lightly infected animals [14], and it could be the useful diagnostic method in Korea, where trichinosis has not been rampant. A disadvantage of ELISA is occurrence of false-negative results during the early stages of infection [14]. In the first outbreak in Korea, the result of the antibody test was positive on the 34th day PI [10]. In our cases, the results of ELISA for the Trichinella antigen were positive only in 2 sera among 8 collected on the 34th day PI, and positivity was additionally recorded in 3 more sera out of 4 examined on the 42nd day. In the fifth patient, ELISA negative conversion was reported on the 42nd day PI (Table 1), whose complaint was only a febrile sensation without myalgia. It was suggested that the infection density of Trichinella larvae might have been low in that patient. Since the 2 negatives on the 32nd day PI could not be followed-up by ELISA, the confirmed patients of trichinosis were only 5 in the present outbreak.

Although the first outbreak was caused by eating of the raw badger meat, M. meles melanogenys, the rest was due to eating the wild boar meat, S. scrofa [10-13]. Because 4 of the outbreaks were concentrated in Gangwon-do, it is supposed that the life cycle of T. spiralis is maintained in Gangwon-do. Examinations of wild animals to determine the prevalence of Trichinella have been frequently performed in other countries. A national survey on 4,517 wild boars revealed 4% seropositive animals in Corsica, France, and 1.4% ELISA-positive wild boars in Germany and 8.7% in Switzerland [15,16]. A survey to estimate the prevalence of trichinosis in wild boars in Korea is thus urgently needed.

Domesticated animals could also be the source of human trichinosis. The outbreaks were caused by eating raw or undercooked pork in China, and the main sources of infection in 2058. Soft-shelled turtles, Taiwan. Emerg Infect Dis 2009; 15: 2056-2058.

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