

Effects of oral amino acid cystine (700 mg) and theanine (280 mg) administration on SARS-CoV-2 virus infection - A case series

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Abstract

An amino acid supplement containing 700 mg of cystine and 280 mg of theanine was administered to 4 patients during the treatment of SARS-CoV-2 virus infection. Negative reactions on polymerase chain reaction (PCR) testing were promptly obtained. Oral ingestion of cysteine and theanine (C/T) may promote SARS-CoV-2 virus elimination.

1 Introduction

COVID-19 is an infectious disease caused by the SARS-CoV-2 virus.[1] The treatment has not been established and vaccine development is delayed. Internationally, the number of SARS-CoV-2-infected patients exceeds 25,000,000. In Japan, [?]70,000 persons have been infected and the number of patients is increasing.[2]

According to a review of patients who died in Japan, persons aged [?]70 years accounted for 80%. The overall mortality rate is 1.6%, but it increases with age. It is [?]1% in those aged 10 to 49 years, whereas the rates in those aged 60 to 69 years, 70 to 79 years, and 80 to 89 years are 1.9, 5.7, and 11.5%, respectively; the mortality rate in elderly persons is reportedly [?]10-times higher than in young persons.[3] As immune deficiency is noted in the elderly, it is important to prevent immune deficiency and improve the immunity in the current situation in which treatment has not been established.

Cystine is synthesized through bimolecular binding of cysteine, as a sulfur-containing amino acid, to disulfide. It is contained in many foodstuffs, including meat. After cellular uptake, cystine is reduced to cysteine. Theanine is a tea component, and is decomposed to glutamic acid and ethylamide after being absorbed in vivo. Intracellular cysteine, glutamic acid, and glycine function as substrates for the synthesis of glutathione, which exhibits the most potent antioxidant actions in vivo.[4]

A previous study reported that the simultaneous administration of cystine and theanine (C/T) stimulated influenza antigen-specific immunoglobulin G (IgG) antibody production via glutathione synthesis in mice. An experiment using old mice also yielded similar results.[5-6] Furthermore, a study involving humans reported that C/T administration significantly increased antibody production after influenza vaccination in elderly patients with malnutrition.[7] These findings suggest that C/T administration influences the clinical course of SARS-CoV-2 virus infection. We report 4 SARS-CoV-2-infected patients who were admitted to our hospital, and treated using a supplement containing cystine (700 mg) and theanine (280 mg), leading to favorable results.

2 Subjects and Methods

The subjects were 4 patients admitted to our hospital under a diagnosis of SARS-CoV-2 virus infection. All patients had positive reactions on polymerase chain reaction (PCR) testing and symptoms such as fever and

dysosmia. They were hospitalized as mild-status patients. A supplement containing cystine (700 mg) and theanine (280 mg) at a total volume of 1.5 g was orally administered once a day from X month 15th until discharge in all patients. While continuing standard treatment, the presence of the virus was examined using PCR testing. After confirming negative reactions on two consecutive sessions of PCR testing, which comprised a criterion for discharge, the patients were discharged. We investigated supplement compliance after the start of administration, PCR testing results, and the interval from the start of supplement administration until negative reactions on two consecutive sessions of PCR testing were obtained.

3 Case presentation

Concerning C/T adherence, C/T ingestion was possible every day in all patients.

Case 1

Patient: A woman in her nineties.

Complaint: Fever.

Medical history: Intestinal obstruction and dementia/hearing loss.

Infectious disease/allergy: Absent.

Present illness: In a nursing-care facility to which she had been admitted, it was clarified that a resident had novel coronavirus infection on X month 8th, 2020. Fever was noted on X month 10th and PCR testing was conducted on the same day. A positive reaction was detected and she was admitted to our hospital on X month 11th.

Physical examination on admission: The height, body weight, and body mass index (BMI) were 150 cm, 40 kg, and 17.78, respectively. The blood pressure, pulse rate, and body temperature were 121/59 mmHg, 71/min, and 36.8°C (after the oral administration of Acetaminophen), respectively.

Laboratory data on admission: Chest X-ray did not demonstrate pneumonia. The TB, AST, ALT, ALP, LDH, γ -GTP, ChE, TP, Alb, Cr, BUN, and CRP levels were 0.26 mg/dL, 20 IU/L, 10 IU/L, 230 IU/L, 218 IU/L, 16 IU/L, 256 IU/L, 6.9 g/dL, 3.6 g/dL, 0.79 mg/dL, 13.3 mg/dL, and 0.30 mg/dL, respectively. The HbA1c value, WBC, RBC, Hb level, Ht value, PLT count, PT-INR, D-dimer level, and ferritin level were 5.6%, 4,000/ μ L (Neut/Lymp=1.19), 438 x 10⁴/ μ L, 12.9 g/dL, 39.4%, 26.5 x 10⁴/ μ L, 0.92, 3.3 μ g/mL, and 169.3 ng/mL, respectively.

Course after admission: Slight fever (37.0 to 37.9°C) persisted, but fever (>38°C) was sometimes observed. The CRP level ranged from 4 to 5 mg/dL. The general condition was maintained, and the patient was discharged on May 21st. No antiviral drug, such as Favipiravir, was used (admission period: 41 days).

C/T administration and PCR testing results

One pack/day of C/T was administered from X+1 month 15th, and this was continued until X+1 month 21st. In this patient, negative and positive reactions on PCR testing were repeatedly detected 4 times, but negative reactions on two consecutive sessions of PCR testing were obtained 5 and 6 days after the start of C/T administration (Figure a).

Case 2

Patient: A woman in her nineties.

Complaint: Fever.

Medical history: Dementia.

Infectious disease/allergy: Absent.

Present illness: In a nursing-care facility to which she had been admitted, it was clarified that a resident had novel coronavirus infection on X month 8th, 2020. Fever was noted on X month 10th and PCR testing was

conducted on the same day. A positive reaction was detected and she was admitted to our hospital on X month 11th.

Physical examination on admission: The height, body weight, and BMI were 136 cm, 37.8 kg, and 20.44, respectively. The SpO₂ was 96% (room air). The blood pressure, pulse rate, and body temperature were 156/87 mmHg, 69/min, and 36.8°C, respectively.

Laboratory data on admission: Chest X-ray did not demonstrate pneumonia. The TB, AST, ALT, ALP, LDH, γ -GTP, ChE, TP, Alb, Cr, BUN, and CRP levels were 0.35 mg/dL, 36 IU/L, 22 IU/L, 260 IU/L, 181 IU/L, 24 IU/L, 227 IU/L, 6.0 g/dL, 3.6 g/dL, 0.47 mg/dL, 12.0 mg/dL, and 0.32 mg/dL, respectively. The HbA1c value, WBC, RBC, Hb level, Ht value, PLT count, PT-INR, D-dimer level, and ferritin level were 5.4%, 4,600/ μ L (Neut/Lymp=1.63), 410 x 10⁴/ μ L, 12.8 g/dL, 38.7%, 18.3 x 10⁴/ μ L, 0.92, 0.9 μ g/mL, and 91.6 ng/mL, respectively.

Course after admission: As fever persisted, the administration of Ceftriaxon at 2 g was started on X month 13th. On X month 14th, the body temperature, respiratory rate, and SpO₂ were 38.1°C, 22 times/min, and 93% (room air), respectively. Chest X-ray did not demonstrate pneumonia. Subsequently, fever transiently reduced, but it recurred on X month 18th. Antibiotic therapy was continued and pyretolysis was achieved on X month 20th. The subsequent condition was stable and the patient was discharged on X+1 month 30th (admission period: 50 days).

No antiviral drug, such as Favipiravir, was used.

C/T administration and PCR testing results

One pack/day of C/T was administered from X+1 month 15th. Even after the start of C/T administration, positive reactions on PCR testing persisted, and the dose was increased to 2 packs from X+1 month 26th. After 3 days, a negative reaction was obtained for the first time. In addition, two consecutive sessions of PCR testing yielded negative reactions (Figure b).

Case 3

Patient: A woman in her forties.

Complaint: Dysgeusia.

Medical history: Not contributory.

Infectious disease/allergy: Absent.

Present illness: Malaise developed on X month 21st, 2020. Headache, nasal obstruction, mild cough, and slight fever were noted from X month 24th. Dysgeusia was observed on X month 27th. PCR testing yielded a positive reaction and the patient was admitted on X month 28th.

Physical examination on admission: The height, body weight, and BMI were 156 cm, 46 kg, and 18.90, respectively. The SpO₂ was 98% (room air). Headache, cough, nasal obstruction, and mild dysgeusia were present. Slight malaise was noted. The blood pressure, pulse rate, and body temperature were 122/78 mmHg, 71/min, and 37.5°C, respectively.

Laboratory data on admission: Chest X-ray did not demonstrate pneumonia. The TB, AST, ALT, ALP, LDH, γ -GTP, ChE, TP, Alb, Cr, BUN, and CRP levels were 0.33 mg/dL, 16 IU/L, 10 IU/L, 125 IU/L, 135 IU/L, 10 IU/L, 230 IU/L, 6.3 g/dL, 3.5 g/dL, 0.45 mg/dL, 7.8 mg/dL, and 0.10 mg/dL, respectively. The WBC, RBC, Hb level, Ht value, PLT count, PT-INR, D-dimer level, and ferritin level were 2,700/ μ L (Neut/Lymp=0.88), 403 x 10⁴/ μ L, 10.9 g/dL, 32.3%, 18.6 x 10⁴/ μ L, 0.91, 0.8 μ g/mL, and 21.5 ng/mL, respectively.

Course after admission: Headache, slight fever, nasal obstruction, cough, and dysgeusia persisted, but the oral administration of Acetaminophen reduced headache. Pyretolysis was achieved on X+1 month 3rd.

Headache subsided on X+1 month 4th and taste was normalized. Subsequently, mild nasal obstruction and cough gradually reduced, and the patient was discharged on X+1 month 21st (admission period: 24 days).

No antiviral drug, such as Favipiravir, was used.

C/T administration and PCR testing results

One pack/day of C/T was administered from X+1 month 15th and this was continued until X+1 month 21st. The results of PCR testing were negative 5 and 6 days after the start of C/T administration (Figure c).

Case 4

Patient: A man in his forties.

Complaint: Dysgeusia.

Medical history: Fracture of the right lower thigh (20 years previously).

Infectious disease/allergy: Absent.

Smoking: Twenty cigarettes x 15 years. Smoking cessation was achieved in the latter half of his thirties.

Present illness: Fever (38°C) and cough developed on X+1 month 5th, 2020. Malaise was noted on X+1 month 6th. Dysgeusia was observed on X+1 month 7th. PCR testing was conducted. On the same day, a positive reaction was detected and the patient was admitted.

Physical examination on admission: The height, body weight, and BMI were 168 cm, 64 kg, and 22.68, respectively. The SpO₂ was 96% (room air). Nasal discharge and mild cough were present. Slight malaise was noted. Dysgeusia and dysosmia were noted. The blood pressure, pulse rate, and body temperature were 128/92 mmHg, 94/min, and 38.3°C, respectively.

Laboratory data on admission: Chest X-ray did not demonstrate pneumonia. The TB, AST, ALT, ALP, LDH, γ -GTP, ChE, TP, Alb, Cr, BUN, CRP, and Zn levels were 0.38 mg/dL, 25 IU/L, 24 IU/L, 128 IU/L, 201 IU/L, 38 IU/L, 395 IU/L, 6.4 g/dL, 3.7 g/dL, 0.83 mg/dL, 8.8 mg/dL, 1.18 mg/dL, and 51 μ g/dL, respectively. The WBC, RBC, Hb level, Ht value, PLT count, PT-INR, D-dimer level, and ferritin level were 3,500/ μ L (Neut/Lymp=3.31), 475 x 10⁴/ μ L, 14.2 g/dL, 41.9%, 14.6 x 10⁴/ μ L, 1.03, 1.0 μ g/mL, and 175.9 ng/mL, respectively.

Course after admission: The general condition was stable, but fever, nasal discharge, cough, and malaise persisted. Dysgeusia reduced from X+1 month 10th. Pyretolysis was achieved on X+1 month 13th. Blood testing revealed slight increases in the CRP, ferritin, and D-dimer levels (1.27 mg/dL, 278.7 ng/mL, and 3.0 μ g/mL, respectively), in addition to a decrease in the Zn level (62 μ g/dL) on X+1 month 14th. Chest X-ray revealed a slight peripheral shadow in the right lower lung field. Subsequently, mild cough was present, but the course was favorable. The patient was discharged on X+1 month 27th (admission period: 21 days).

No antiviral drug, such as Favipiravir, was used.

C/T administration and PCR testing results

One pack/day of C/T was administered from X+1 month 15th and this was continued until X+1 month 27th. PCR testing yielded a positive reaction 4 days after the start of C/T administration, but negative reactions were obtained 11 and 12 days after its initiation (Figure d).

4 Discussion

In Japan, COVID-19 was authorized as a designated infectious disease. After infection is confirmed, reporting and admission/isolation are required. In Aomori Prefecture (population: 1,250,000 persons), where our hospital is located, 35 patients with SARS-CoV-2 virus infection have been confirmed. At our hospital, as a medical institution designated for infectious diseases, 14 patients were hospitalized/treated. Criteria for

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Φιγυρε Λεγεנדς

Αδμισιον περιοδ, ΠΡP τεστινγ ρεσυλτς, C/T δοσε, ανδ αδμισιαστρατιον περιοδ ιν 4 πατιεντς ινφερςτεδ ωιτη ΣΑΡΣ-δ"-2

