Treating Severe Acute Respiratory Syndrome with Integrated Chinese and Western Medicine - A Report on 103 Hospitalised Cases at the Second Affiliated Hospital of Guangzhou University of Chinese Medicine, China

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Abstract

In this article, we report the clinical presentations of and the treatment protocol for 103 patients with severe acute respiratory syndrome (SARS) hospitalised at the Second Affiliated Hospital of Guangzhou University of Chinese Medicine during an outbreak in early 2003. According to Chinese medicine diagnostics, SARS fell into the category of Warm Pestilential Disease (Wen Yi Bing) which primarily, though not exclusively, affected the lung. 77 (75.8%) of this group of patients were diagnosed as severe cases and 29 (28.2%) were admitted to the intensive care unit. The treatment protocol mainly comprised the integration of Chinese and Western medicine, using a treatment approach based both on Chinese medical pattern differentiation and treatment, and Western medicine. A total of 96 (93.2%) patients were discharged after successful treatment and seven patients died (6.8%). There was a mean of 6.7±3.9 days between the onset of symptoms and the absence of fever in the 96 recovered cases and 94 of them showed resolution of lung opacities within a mean of 18.3±8.9 days. Two cases developed pulmonary fibrosis as showed on chest radiographs. We believe that Chinese medicine can play a positive role in the clinical management of SARS.

Key words

Atypical Pneumonia, integrated Chinese and Western medicine, Severe Acute Respiratory Syndrome (SARS), treatment based on pattern differentiation.

Introduction

In early 2003, there was an outbreak of so-called Atypical Pneumonia in Guangdong Province in southern China. This type of pneumonia turned out to be highly contagious, particularly among health-care workers, and was resistant to antibacterials. In late February 2003, the World Health Organization (WHO) officially named Atypical Pneumonia "Severe Acute Respiratory Syndrome (SARS)"[1]. On 16 April, the WHO announced that the cause of SARS was a novel coronavirus[2]. As of early May, the SARS epidemic has spread to over 30 countries and regions and affected over 7000 patients, with over 500 deaths. Being one of the main hospitals in Guangzhou city, the Second Affiliated Hospital of Guangzhou University of Chinese Medicine admitted 112 SARS patients between January and April 2003. Among these, nine were transferred to other hospitals in Guangzhou due to a shortage of beds. This article presents clinical data and describes the development of treatment protocols for SARS, and its clinical outcome.

Methods

Patients

The 103 cases of SARS reported in this article were all hospitalised patients in the Second Affiliated Hospital of Guangzhou University of Chinese Medicine.

Diagnostic criteria

All cases were diagnosed from "Clinical Diagnostic Criteria for Atypical Pneumonia"[3] and "Guidelines for Admission of Atypical Pneumonia patients in hospitals in Guangdong province"[4]. Confirmation of the diagnosis was based on the epidemiological history of contact (including history of transmitting the disease to others), fever, myalgia, non-elevation of the peripheral white blood cell counts, chest radiographs showing air-space opacities, non-responsive to antibacterials and exclusions of upper respiratory infection, influenza, bacterial and fungal pneumonia.

Treatment protocol

The treatment protocol developed in our hospital mainly consisted of integrated Chinese and Western approaches.

Western approach

This was mainly composed of nutritional support, oxygen supplementation, non-invasive ventilatory procedure, infection control, immuno-modulation, anti-inflammation with steroids and other means of symptom management.

Nutritional support

Nutritional support was achieved by intravenously giving energy complex, composite amino acids and vitamins. And for patients with scanty food intake, intravenous fatty cream was administered and intravenous albumin was given to those with low albumin level.

Oxygen supplement and ventilatory support

Oxygen supplementation through the nasal cannula might be used according to the degree of oxygen saturation and breath rate. For those with breathing difficulties, non-invasive oxygen face mask or invasive intubation ventilatory procedure might be required. Usually, for patients with breath rate > 30 times/min while on 3-5 L/min oxygen and $Sa0_2$ (oxygen saturation) < 93%, non-invasive positive ventilation employing CPAP method, the pressure of which ranging from 4-10cmH_2O, should be continually used until ventilation distress improved. On the other hand, if the patient had $Sa0_2$ < 90% or oxygen incorporation index <200mmHg while on 5 L/min oxygen and the non-invasive positive ventilation had proven to have little effect, or the procedure was not tolerated by the patient, intubation or mechanical ventilation procedure should be conducted.

Use of corticosteriods

Corticosteriods were only used in critical patients showing symptoms of severe toxicity, for instance, if the patient had high fever (BT > 38.5°C) that persisted for more than 3 days, or the chest radiograph indicated a progressive deterioration. The corticosteriods regimen used in our patients was mainly methylprednisolone, the dose of which ranged from 40-240 mg/d for less severe cases to 500 mg/d for critical cases according to the clinical manifestations.

Use of antibiotics

Regimen 1 for early stage: azithromycin plus one type of -lactams. Azithromycin was administered intravenously at 0.5 g/d in the first day, followed by intravenous 0.25 g/d of the same drug with concurrent use of -lactams for the subsequent consecutive 6 days. The main -lactams used were: (i) cefotaxime sodium 2-4 g/d, administered intravenously twice daily, or (ii) ceftazidime 2-6 g/d, administered intravenously twice to thrice daily, or (iii) amoxycillin-clavulanic acid 1.2g given intravenously at every 8 hours interval. Regimen 2 for early stage: ciprofloxacin 0.3 g/d intravenously, with concomitant use of tetracycline 0.5 g four times daily. If the sputum bacteriological culture showed the presence of antibiotic-resistant strains of bacteria, demethylvancomycin could also be used.

Use of immuno-modulatory agents

Generally, immunoglobulin was given intravenously at the dose of 5 g/d for consecutive 3 days. For patients of the advanced stage, thymosin was given subcutaneously at the dose of 1.6mg, once every 3 days in addition to the immunoglobulin.

Symptom management

Patients with persistent high fever (BT > 38.5°C) were treated with non-steroidal anti-inflammatory drugs. Pentoxyverine and codeine were taken orally for patients with conspicuous cough.

Treatment with Chinese herbal medicine

According to the history of onset and clinical manifestations, we categorised all the cases into one of four stages: i. early stage, ii. intermediate stage, iii. extreme stage (peak stage), and iv. recovering stage. Pattern differentiation was conducted using the (four stage) wei-qi-ying-xue differentiation and the (triple heater) san-jiao differentiation methods, and treatment strategies were subsequently established and herbal formulae prescribed in accordance with the pattern differentiation.

Early stage

This stage coincides approximately with the first to fifth days after the onset of the disease. The common clinical manifestations of this stage were fever, aversion to cold, heaviness and pain of the body, lassitude, nausea and vomiting, diarrhoea, and a greasy and slippery tongue coating. We differentiated this stage as damp heat obstructing and constraining the lung and wei (defensive) function. Accordingly, the treatment strategies of a. using light substances to expel pathogens from the exterior, and b. clearing heat and dissolving dampness from within were duly advocated. The formulae and herbs used are as follows: *San Ren Tang* (Three-Nut Decoction) combined with *Sheng Jiang San* (Ascending-Descending Powder) with modifications was prescribed: Xing Ren (Semen Pruni Armeniacae) 12g, Bai Dou Kou (Fructus Cardamomi Rotundi) 5g (crushed, not to be boiled for long), Sheng Yi Yi Ren (Semen Coicis Lachryma-jobi) 20g, Hua Shi (Talcum) 15g, Tong Cao (Medulla Tetrapanacis Papyriferi) 6g, Zhu Ye (Herba Lophatheri Gracilis) 10g, Hou Po Hua (Flos Magnoliae Officinalis) 10g, Fa Ban Xia (Rhizoma Pinelliae Ternatae) 10g, Jiang Can (Bombyx Batryticatus) 6g, Chan Yi (Periostracum Cicadae) 6g, Pian Jiang Huang (Rhizoma Curcumae Longae) 9g, Cang Zhu (Rhizoma Atractylodis) 6g, Qing Hao (Herba Artemisiae Apiaceae) 10g, Huang Qin (Radix Scutellariae Baicalensis) 10g.

• If patients manifested exterior cold with interior heat, as well as dampness, treatment strategies should aim to expel the exterior by using pungent and cold substances, and to disseminate the lung qi and dissolve dampness. The formulae for this pattern were combined *Yin Qiao San* (Honeysuckle and Forsythia Powder), *Ma Xing Shi Gan Tang* (Ephedra, Apricot Kernel, Gypsum and Licorice Decoction) and *Sheng Jiang San* (Ascending-Descending Powder) with modifications: Sheng Ma Huang (Herba Ephedrae) 6g, Xing Ren (Semen Pruni Armeniacae) 10g, Sheng Shi Gao (Gypsum)

30g, Zhi Gan Cao (Radix Glycyrrhizae Praeparatae) 6g, Jiang Can (Bombyx Batryticatus) 10g, Chan Yi (Periostracum Cicadae) 6g, Bo He (Herba Menthae) 6g, Lian Qiao (Fructus Forsythiae Suspensae) 15g, Jin Yin Hua (Flos Lonicerae Japonicae) 15g, Huang Qin (Radix Scutellariae Baicalensis) 10g, Lu Gen (Rhizoma Phragmitis Communis) 15g, Sheng Yi Yi Ren (Semen Coicis Lachryma-jobi) 20g, Pian Jiang Huang (Rhizoma Curcumae Longae) 9g.

Intermediate stage

This stage usually corresponded to days 3-10 from the onset of the disease, with common clinical manifestations of aggravated fever, shortness of breath, quickened breathing, distention in the chest and upper abdomen, and diarrhoea. The pathogenesis of this stage was damp-heat and toxin mingling in the body, and treatment should aim to clear heat, transform dampness and relieve toxicity. *Gan Lu Xiao Du Dan* (Sweet Dew Special Pill to Eliminate Toxin) with modifications was considered appropriate for the treatment: Sheng Shi Gao (Gypsum) 30g, Xing Ren (Semen Pruni Armeniacae) 10g, Hua Shi (Talcum) 20g, Huang Qin (Radix Scutellariae Baicalensis) 10g, Chai Hu (Radix Bupleuri) 12g, Yin Chen Hao (Herba Artemisiae Capillaris) 15g, Shi Chang Pu (Rhizoma Acori Graminei) 10g, Fa Ban Xia 10g, Hu Zhang (Radix et Rhizoma Polygoni Cuspidati) 15g, Bai Dou Kou (Fructus Cardamomi Rotundi) 6g (crushed, not to be boiled for long), Jiang Can (Bombyx Batryticatus) 10g, Chan Yi (Periostracum Cicadae) 6g, Cang Zhu (Rhizoma Atractylodis) 6g, Jiang Huang (Rhizoma Curcumae) 10g.

• If the pattern was discerned as shaoyang obstruction by invading pathogens, then the treatment should aim to clear the heat pathogen out of the shaoyang, and to divert damp heat out of the body. *Hao Qin Qing Dan Tang* (Artemisia Annua and Scutellaria Decoction to Clear the Gallbladder) with modifications should be employed to achieve this purpose: Qing Hao (Herba Artemisiae Apiaceae) 10g (not to be boiled for long), Zhu Ye (Herba Lophatheri Gracilis) 10g, Fa Ban Xia (Rhizoma Pinelliae Ternatae) 10g, Chi Fu Ling (Sclerotium Poriae Cocos Rubrae) 15g, Huang Qin (Radix Scutellariae Baicalensis) 10g, Chen Pi (Pericarpium Citri Reticulatae) 6g, Xing Ren (Semen Pruni Armeniacae) 10g, Sheng Yi Yi Ren (Semen Coicis Lachryma-jobi) 30g, Hua Shi (Talcum) 20g, Qing Dai (Indigo Pulverata Levis) 6g (wrapped in a cotton bag), Cang Zhu (Rhizoma Atractylodis) 6g, Yu Jin (Tuber Curcumae) 10g.

Extreme stage (Peak stage)

This stage was usually seen about 7-14 days from the first occurrence of clinical symptoms. The characteristic features of this stage were shortness of breath and difficult breathing and/or purplish complexion. The pathomechanism of this stage was chiefly the confluence of damp-heat-toxin that obstructed and disturbed the lung function. The treatment strategies should focus on clearing heat and transforming dampness, relieving the obstruction and disseminating the lung qi. Formulae used included *Wu Hu Tang* (Five-Tiger Decoction), *Ting Li Da Zao Xie Fei Tang* (Descurainia and Jujube Decoction to Drain the Lungs) in combination with *Lian Po Yin* (Coptis and Magnolia Bark Decoction) with modifications: Zhi Ma Huang (Herba Ephedrae) 6g, Sheng Shi Gao (Gypsum) 30g (boiled first), Xing Ren (Semen Pruni Armeniacae) 10g, Zhi Gan Cao (Radix Glycyrrhizae Praeparatae) 6g, Lu Cha (Folium Thea Sinensis) 15g, Ting Li Zi (Semen Tinglizi) 10g, Chuan Lian Zi (Fructus Meliae Toosendan) 10g, Chuan Po (Cortex Magnoliae Officinalis) 10g, Zhi Shi (Fructus Citri seu Ponciri Immaturus) 10g, Shan Zhi Zi (Fructus Gardeniae Jasminoidis) 10g, Dan Dou Chi (Semen Sojae Praeparatum) 10g, Shi Chang Pu (Rhizoma Acori Graminei) 10g, Lu Gen (Rhizoma Phragmitis Communis) 20g, Fa Ban Xia (Rhizoma Pinelliae Ternatae) 10g, Jie Geng (Radix Platycodonis) 9g.

If the patient also complained of nausea and vomiting, Su Geng (Caulis Perillae), Huo Xiang Geng (Caulis Patchouli), Bai Dou Kou (Fructus Cardamomi Rotundi), Sheng Jiang (Rhizoma Zingiberis Officinalis Recens), Zhu Ru (Caulis Bambusae in Taeniis) and Ju Pi (Pericarpium Citri Reticulatae) were among the herbs selected depending on the degree of dampness manifested.

• If the patient also had constipation, Sheng Da Huang (Radix et Rhizoma Rhei), Hu Zhang (Radix et Rhizoma Polygoni Cuspidati), Zhi Shi (Fructus Citri seu Ponciri Immaturus) and Quan Gua Lou (Fructus Trichosanthis) could be incorporated into the above prescription to treat the large intestine so that the lung could benefit.

• If diarrhoea was seen, one could select Wan Can Sha (Excrementum Bombycis Mori), Huo Tan Mu (Polygonum Chinense), Ge Gen (Radix Puerariae), Che Qian Cao (Herba Plantaginis) and Guang Mu Xiang (Radix Aucklandiae) to add to the above prescription.

• A small number of patients manifested the pattern of heat pathogen entering the ying (nutritive) and xue (blood) phases, together with injury to qi and yin. Treatment principles such as clearing heat in the ying phase, relieving toxicity, and replenishing qi and nourishing yin were advocated. Formulae used were a combination of *Qing Ying Tang* (Clear the Nutritive Level Decoction) and *Sheng Mai Yin* (Generate the Pulse Decoction) with modifications: Shui Niu Jiao (Cornu Bubali) 30g, Sheng Di Huang (Radix Rehmanniae Glutinosae) 15g, Xuan Shen (Radix Scrophulariae Ningpoensis) 15g, Jin Yin Hua (Flos Lonicerae Japonicae) 15g, Xi Yang Shen (Radix Panacis Quinquefolii) 5g (boiled separately), Mai Men Dong (Tuber Ophiopogonis Japonici) 10g, Shan Yu Rou (Fructus Corni Officinalis) 15g.

If the patient developed collapse of the heat type, *Shen Mai Injection* 100-200 ml/d was intravenously administered, with concomitant oral administration of half a pill of *An Gong Niu Huang Wan* (Calm the Palace Pill with Cattle Gallstone) and a decoction of Xi Yang Shen (Radix Panacis Quinquefolii) 10g and Shan Yu Rou (Fructus Corni Officinalis) 30g, twice a day.

• If collapse of cold type was diagnosed, *Shen Fu Injection* 20-100ml/d was administered intravenously, with concurrent administration of a decoction of Hong Shen (Radix Ginseng) 10g, Pao Fu Zi (Radix Aconiti Carmichaeli

Praeparatae) 10g and *Su He Xiang Wan* (Liquid Styrax Pill) (half pill each time, twice a day).

• If the patient showed no signs of bleeding, herbs for invigorating blood circulation and removing blood stasis were usually combined and the following injection preparations were used for this purpose: *Xiang Dan Injection* 30 ml with 5% GS 250ml given once a day intravenously or *Chuan Xiong Qin Injection* 160 mg with 5% GS 250ml or 0.9% NaCl 250ml administered once a day intravenously.

Recovering stage

This stage usually occurred between 10-14 days after the onset of clinical symptoms. The pathomechanism of this stage was deficiency of genuine qi and lingering of pathogens such as dampness and blood stasis in the body. The treatment emphasis should be replenishing the genuine qi and expelling the pathogens, and focus should also be placed on dampness transformation and blood stasis removal. If the pattern differentiation was established as injury to both qi and yin, *Sha Shen Mai Dong Tang* (Glehnia and Ophiopogonis Decoction) should be employed with modifications: Tai Zi Shen (Radix Pseudostellariae Heterophyllae) 15g, Sha Shen (Radix Glehniae Littoralis) 10g, Mai Men Dong (Tuber Ophiopogonis Japonici) 10g, Bai Bian Dou (Semen Dolichoris Lablab) 12g, Zhi Gan Cao (Radix Glycyrrhizae Praeparatae) 3g, Shan Yao (Radix Dioscoreae Oppositae) 10g, Yu Zhu (Rhizoma Polygonati Odorati) 10g, Fa Ban Xia (Rhizoma Pinelliae Ternatae) 6g, Lu Gen (Rhizoma Phragmitis Communis) 15g.

• A pattern of qi deficiency accompanied by dampness and blood stasis would incur the use of treatment strategies to tonify qi, transform dampness, invigorate blood circulation and unblock the channels. Formulae for achieving these treatment strategies included the combination of *Li Shi Qing Shu Yi Qi Tang* (Master Li's Decoction to Clear Summerheat and Augment the Qi), *Shen Ling Bai Zhu San* (Ginseng, Poria and Atractylodes Macrocephala Powder) and *Xue Fu Zhu Yu Tang* (Drive Out Stasis in the Mansion of Blood Decoction), with modifications: Tai Zi Shen (Radix Pseudostellariae Heterophyllae) 15-30g, Sheng Bai Zhu (Rhizoma Atractylodis Macrocephalae) 15g, Fu Ling (Sclerotium Poriae Cocos) 15g, Bai Bian Dou (Semen Dolichoris Lablab) 10g, Sheng Yi Yi Ren (Semen Coicis Lachryma-jobi) 30g, Pei Lan (Herba Eupatorii Fortunei) 10g, Yu Jin (Tuber Curcumae) 10g, Fa Ban Xia (Rhizoma Pinelliae Ternatae) 10g, Tao Ren (Semen Persicae) 10g, Dan Shen (Radix Salviae Miltiorrhizae) 12g, Dang Gui (Radix Angelicae Sinensis) 10g, Chi Shao (Radix Paeoniae Rubrae) 12g, Ren Dong Teng (Ramus Lonicerae Japonicae) 30g.

Results

General clinical data

Of 103 cases of SARS patients, 44 were male and 59 female. The age ranged from 19 years to 75 years (mean 34.6 ±12.6). 93 (90.2%) patients could be traced to have a history of contact, and the remaining 10 cases had no apparent contact history. The average period between the onset of clinical symptoms to admission to the hospital was 3.5 ± 2.6 days.

Common clinical features including tongue and pulse

All 103 cases were reported to have fever, with BT 39.00±0.60°C. Among them, 81 cases recorded BT > 39 °C (78.6%). Pain in the joints and muscles was seen in 56 cases (54.3%), aversion to cold in 54 cases (52.4%), diarrhoea in 47 cases (45.6%), lassitude in 51 cases (49.5%), shortness of breath in 41 cases (39.8%), distension in the chest in 40 cases (38.8%), headache in 40 cases (38.8%), cough in 37 cases (35.9%), bloody sputum in 2 cases (1.9%), nausea and vomiting in 8 cases (7.7%), red tongue in 77 cases (74.7%), thin yellow tongue coating in 49 cases (47.5%), yellow and greasy tongue coating in 41 cases (39.8%), and white and greasy tongue coating in 10 cases (9.7%).

Case severity evaluation

Of 103 cases admitted into our hospital, 77 were considered to have severe atypical pneumonia. All these severe cases demonstrated the involvement of multiple lung lobes, and rapid progression of the disease. Desaturation of oxygen in the blood and acute respiratory distress syndrome (ARDS) and multiple-organ dysfunction syndrome (MODS), which would require treatment in the intensive care unit, were observed in some of these severe patients. 40 of these severe cases required non-invasive and 8 needed invasive ventilatory support. Table 1. delineates the clinical data of the severe cases of SARS.

Table 1. Clinical data for severe cases of SARS

Item observed	Case number	%
Chest radiograph showing more than 2 lobes of lung involvement	77	74.8
Rapid progressive changes of chest radiograph i.e. > 50% lung involvement within 48 hours	21	20.4
Breath rate > 30/min	41	39.8
Oxygen desaturation*	52	50.5
ARDS	18	17.5
MODS	8	7.8
Pre-existing chronic diseases**	16	15.5

Oxygen desaturation means SaO2 < 93% or oxygen incorporation index < 300 mmHg while on 3-5 L/min oxygen

**Pre-existing diseases included 3 patients with diabetes, one of whom had had diabetic lower limb amputation; 3 cases of coronary heart disease; 2 cases of chronic kidney failure; one case with ulcerative inflammatory bowel disease; 5 cases with hypertension and 1 case of chronic hepatitis

Use of corticosteriods

69 cases of our SARS patients used corticosteriod methylprednisolone, ranging from the minimal dose of 20 mg/d to 500 mg/d.

Treatment outcome

Of 103 cases treated, 96 cases (93.2%) recorded complete clinical recovery (afebrile without medication for 7 days, significant improvement on chest radiograph and absence of other clinical symptoms) and 7 cases (6.8%) deaths. Among the 96 recovered patients, 94 cases showed a total absence of abnormality on chest radiographs, and only two cases showed pulmonary fibrosis on chest radiographs. The time for absorption of pathogenic infiltrates as seen from the chest radiographs was 18.1±8.9 days. One was reported to have deteriorated vision. The time between admission and fever recession was 6.7±3.9 days.

Discussion

SARS as a newly emerging contagious disease fell into the category of "warm pestilential disease" and its main targeted organ was the lung, although it also involved the spleen and stomach according to our clinical observations. Its main manifestations included fever, lassitude, shortness of breath and cough, and was often accompanied with nausea, vomiting, distension in the chest, diarrhoea, a bland taste and sticky feeling in the mouth and lack of appetite. Judging from the clinical manifestations, the pathomechanism of SARS could be attributed to the concomitant involvement of both wei and qi phases, plus damp heat and congealed blood obstructing the upper and middle jiaos. In the meantime, the pathogens, i.e. heat and dampness, could readily injure the lung and spleen qi and easily damage the body's yin. The condition was also prone to transmitting within the body organs. In view of its clinical manifestations and natural history, and in accordance with the wei-qi-ying-xue and san-jiao differentiations, we categorised it into four different stages, i.e. early stage, intermediate stage, extreme stage (peak stage) and recovering stage.

In the early stage, most patients demonstrated fever, aversion to cold, heaviness and pain in the body, lassitude, nausea and vomiting and diarrhoea, all of which pointed to a clinical pattern of damp heat obstruction and involvement of both wei and qi phases. As for the treatment, we elected to use light substances to expel the heat and dissolve the dampness, and used formulae such as *San Ren Tang*, *Sheng Jiang San* and *Ma Xing Shi Gan Tang* with modifications.

The key features of the intermediate stage were aggravated fever, shortness of breath, distension of the chest and abdomen and diarrhoea, indicating a pattern of damp heat transforming to toxicity and constraining the shaoyang channel. For treatment, one should aim to clear heat and dampness, disseminate and regulate constrained qi movement. Formulae such as *Gan Lu Xiao Du Dan* and *Hao Qin Qing Dan Tang* were employed to achieve these strategies. In the extreme stage, the condition was characterised by extreme fever, severe shortness of breath and difficulty in breathing, and restlessness, or even dark purplish complexion and lips, profuse sweating and coldness in the limbs. These manifestations were due to exuberant damp-heat-toxin that severely obstructed the lung qi, and consumed the body's qi and yin, as well as causing congealed blood. In terms of treatment, while it was urgent to expel the pathogens, it was also necessary to emphasise supplementing the genuine qi and yin essence. Formulae such as *Wu Hu Tang*, *Ting Li Da Zao Xie Fei Tang*, *Qing Ying Tang*, *Xi Jiao Di Huang Tang* – all were therapeutically potent – could be selected. At the same time, one could also add *Er Chen Tang* (Two-Cured Decoction), *San Zi Yang Qin Tang* (Three-Seed Decoction to Nourish one's Parents) and *Xiao Cheng Qi Tang* (Minor Order the Qi Decoction) in order to strengthen the effects of qi regulation, dampness transformation and obstruction opening. On the other hand, *Du Shen Tang* (Unaccompanied Ginseng Decoction) was applied to quickly replenish the damaged genuine qi.

Weakened genuine qi and the lingering of pathogens such as dampness and blood stasis characterised the pathomechanism of the recovering stage. The clinical signs of this stage included restlessness, dry mouth and thirst, tiredness, shortness of breath on movement and lack of appetite. Treatment should focus on replenishing the genuine qi and expelling the pathogens by using methods of dampness transforming and blood invigorating. *Sheng Mai San*, *Sha Shen Mai Dong Tang*, *Li Shi Qing Shu Yi Qi Tang*, *Shen Ling Bai Zhu San* and *Xue Fu Zhu Yu Tang* were among the formulae we used to deal with the clinical situation in the recovering stage. A number of patients at this stage also manifested symptoms such as skin lesions, itchy skin and watery rashes - signs of damp heat steaming in the skin and muscles. To deal with the skin manifestations, we used methods of clearing damp heat and expelling pathogens from the body via the skin. Herbs prescribed were as follows: *Ma Huang Lian Qiao Chi Xiao Dou Tang* (Ephedra, Forsythia and Phaseoli Seed Decoction) plus Di Fu Zi (Fructus Kochiae Scopariae), Bai Xian Pi (Cortex Dictamni Dasycarpi Radicis), Fang Feng (Radix Ledebouriellae Sesloidis), Chan Yi (Periostracum Cicadae), Sang Ye (Folium Mori Albae), Chi Shao (Radix Paeoniae Rubrae) and Mu Dan Pi (Cortex Moutan Radicis).

We are able to make a few comments derived from the experience of managing the SARS epidemic using the integrated approach of Chinese and Western medicine.

- From the perspective of Chinese medicine, the aetiology of the SARS epidemic was mainly dampness and heat, and the pathomechanism of this condition could be ascribed to damp phlegm obstructing the upper and middle jiaos, suffocating the movement of lung qi and injuring the lung and spleen qi. In extreme cases, it would also result in collapse of yin and yang. As far as treatment is concerned, qi disseminating and regulating, and dampness transforming, should be advocated throughout the whole course of the disease development.

• At the early stage, the disease usually manifested with concomitant involvement of the wei and qi phases, often accompanied by dampness pathogen, hence treatment strategies should focus on both wei and qi phases and use exterior expelling herbs to facilitate the outbound movement of the pathogen. It is worth noting that severely cold substances are contraindicated at this stage.

• SARS is characterised by acute onset and rapid transformation, and did not always conform to the normal transmission pathway of warm disease. For instance, out of 103 cases in our study, 21 showed a rapid pathogenic progression to the lung (over 50% of the lung involved) according to chest radiographs within the first 48 hours and 41 patients developed signs of respiratory distress (breath rate > 30/min). To deal with these critical cases which were associated with depletion of the genuine qi and collapse of yin and yang while the pathogens were still exuberant, we on the one hand used heavy doses of heat clearing and dampness dissolving and lung qi disseminating herbs, and on the other hand employed sufficient amount of intravenous *Shen Mai Injection* and *Shen Fu Injection* in order to protect the genuine qi and reverse the collapse of yin and yang. Other emergency procedures such as oxygen supplementation, ventilatory support and infection control were also mandatory.

• Because dampness was the key pathogen in causing SARS, it is not surprising that it also affected the spleen and the stomach and caused stagnation of qi movement. 47 cases in the study presented symptoms such as nausea and vomiting or diarrhoea. We employed the treatment principles of disseminating lung qi and dissolving dampness while the dampness was in the upper jiao; clearing heat and transforming dampness when the dampness stagnated in the middle jiao; and using substances with a bland taste to induce diuresis when the dampness was primarily in the lower jiao. In so doing, the clinical manifestations of nausea and vomiting and diarrhoea were effectively improved.

• At the recovering stage, patients primarily displayed signs of deficient genuine qi together with retention of dampness and congealed blood, as demonstrated by the clinical features of shortness of breath, lassitude, asthmatic breathing, lack of appetite and greasy tongue coating. It was interesting to note that a small proportion of patients had purple and dark tongue body and experienced slow absorption of the infiltrate as seen on chest radiographs. However, using qi tonifying and yin nourishing, and dampness dissolving and blood invigorating herbs significantly quickened their recovery. Using damp heat clearing and wind expelling herbs could effectively treat the skin rashes and itchiness experienced by some patients.

• It was important to treat cases at the early stage if at all possible. From our experience, early intervention could combat the pathogens (virus) head-on and effectively reverse the course of the disease development and enabled the sufferers to enter the recovering stage very quickly.

• It was apparent from the clinical manifestations that the patients' immune systems were disrupted by the pathogens (virus), a situation that could result in other secondary infections. Through using a holistic approach and treatment based on pattern differentiation, the Chinese medical intervention could modulate the body's immune response and ameliorate the organic damage inflicted by virus-induced abnormal immunological response.

In summary, we believe that the use of integrated Chinese and western medical approaches certainly contributed to a better clinical outcome in the fight against SARS. However, due to the acute, contagious and rapidly changing nature of the disease, it has not been possible or ethical so far to conduct controlled studies in order to evaluate the efficacy of our treatment protocol. Further controlled studies may be able to demonstrate the effectiveness of the Chinese medical intervention on SARS.

Acknowledgements

The authors would like to express their gratitude to Prof. Deng Tie-tao and Prof. Peng Sheng-quan of Guangzhou University of Chinese Medicine, Prof. Ren Ji-xue of Changchun College of Chinese Medicine, Professors Jiao Shu-de and Chao En-xiang of the Sino-Japan Friendship Hospital, Professors Lu Zhi-zheng and Lu Guang-xin of the China Academy of Chinese Medicine, Prof. Yan De-xing of the Medical College, Shanghai Tongji University and Prof. Zhou Zhong-ying of Nanjing University of Chinese Medicine for their guidance during the establishment of the treatment protocol for SARS. This article is dedicated to the many frontline health-care workers who have shown tremendous courage and devotion to duty throughout the SARS epidemic.

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