Case report

Septic embolism in a patient with infective endocarditis and corona virus disease 2019: a case report and review of management

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ABSTRACT

Background: The diagnosis and treatment of infective endocarditis (IE) is facing great challenges during the corona virus disease 2019 (COVID-19) pandemic, especially in patients without valvular heart disease. **Methods:** The 39-year-old patient with no pertinent medical history presented with high fever for 14 d and positive nucleic acid test results for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) 3 h ago. The patient denied any trauma or IV drug use. Eight samples, including two sets of both upper and lower limbs, were collected in the morning and afternoon respectively on the first day of hospitalization. And multidrug-resistant staphylococcus aureus (MRSA) were positive in all blood cultures for 4 d. Computed tomography (CT) revealed infectious metastases in spleen, liver, kidney and brain. Transesophageal echocardiography (TEE) was performed under safety protection finding mitral valve vegetation. The patient's senses of smell, taste, hearing and vision were weakened about 3 d. The patient was treated with daptomycin in combination with fosfomycin sodium and linezolid successively. On hospital d 10, the patient was transferred to intensive care unit (ICU) due to respiratory distress and cardiac insufficiency for 5 d with high flow oxygen noninvasive ventilation. After treatment, the patient achieved remission and was discharged from hospital. **Results:** This patient was a typical case of IE with multiple organ infection caused by MRSA sepsis combined with COVID-19, for which combination therapy was effective. **Conclusions:** Obvious risk factors of IE may be absent in many cases. A high index of suspicion is required, especially with additional findings such as embolic phenomenon, focal neurologic deficit, decompensated heart failure, or new murmurs. The purpose of this case report is to help clinicians by improving awareness of IE, particularly in patients having high suspicion despite any risk factors, during COVID-19 pandemic.

Key words: COVID-19, infective endocarditis, multidrug-resistant staphylococcus aureus, diagnosis, treatment

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INTRODUCTION

The corona virus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), has emerged as a critical public health challenge. Infective endocarditis (IE) is a serious bacterial infection of the endocardium and/or heart valves with high mortality rate.[1–3] Patients often do not demonstrate risk factors or specific symptoms, which makes the diagnosis difficult, especially during current COVID-19 pandemic.[4,5] Until now, reports on COVID-19 patients with IE are limited. Here, this study reported the first confirmed case of COVID-19 with IE presenting MRSA bacteremia and multiple organ embolism, ultimately achieved remission.

CASE REPORT

The patient was a 39-year-old male who presented with fever for 14 d and positive nucleic acid test results for SARS-CoV-2 for 3 h. On December 24, 2020, the patient developed fever (body temperature >39°C) and treated with moxifloxacin and ceftriaxone successively at a fever clinic. On January 6, 2021, SARS-CoV-2 nucleic acid test revealed positive, the patient immediately transferred to the COVID-19 treatment center. The patient had no chronic diseases history and denied any trauma or IV drug use.

On admission (January 6, 2021), temperature 39.5°C, blood pressure 129/74 mmHg, oxygen saturation (SO_2) 97% (nasal cannula, oxygen 3 L/min), petechiae on the left little and ring fingers with maximal diameter of 3 mm, and apical systolic grade II/III murmur. Eight samples including two sets of both upper and lower limbs were collected in the morning and afternoon respectively, and blood cultures were performed. Laboratory investigations were as followed: white blood cells (WBC) 15.8×10^9/L, lymphocytes (L) 1.0×10^9/L, neutrophils (N) 13.4×10^9/L, C-reactive protein (CRP) 185 mg/L, interleukin (IL)-6 34.3 pg/mL, procalcitonin (PCT) 1.36 ng/mL, D-dimer (D-D) 2.72 mg/L (Table 1). Arterial blood gas analysis yielded the following findings: pH=7.523, partial pressure of oxygen (PO_2) 66.4 mmHg, partial pressure of carbon dioxide (PCO_2) 29.3 mmHg, lactate 1.5 mmol/L, oxygenation index (OI, PO_2/fraction of inspired oxygen [FiO_2]) 201 mmHg. Lung computed tomography (CT) revealed patchy ground-glass opacities in the right lung (Figure 1A). The patient was diagnosed with COVID-19 (moderate type), high probability of IE.

Day 2, transthoracic echocardiography (TTE) revealed mild mitral valve prolapse (Figure 1K) with regurgitation (Figure 1L) and left ventricular ejection fraction (LVEF) of 56.4%. CT revealed infectious foci in spleen (Figure 1D), kidney (Figure 1H), liver (Figure 1G) and intracranium with small hemorrhage in the left frontal lobe (Figure 1E). Blood cultures grew multi-drug-resistant Staphylococcus aureus (MRSA). He was treated with daptomycin (0.8 g/d, 10 mg/kg/d) combined with fosfomycin sodium (16 g/d). Day 5, blood cultures were negative. Day 8, his senses of smell, taste, hearing and vision were weakened, and Osler's nodes appeared in the left little finger (Figure 1I). Repeat CT revealed progressive inflammation in both lungs (Figure 1B) and obvious edema around intracranial infarct focus (Figure 1F). Nucleic acid test result for SARS-CoV-2 was negative. Day 10, the patient experienced diarrhea, vomiting, headache, shortness of breath with SO_2 88%, then was transferred to intensive care unit (ICU). Noninvasive assisted ventilation (FiO_2 50%) was used to the patient whose SO_2 increased to 94%–98%. Day 11, the patient was examined by transesophageal echocardiography (TEE) which found an additional isoechoic mass (1.2 cm × 1.2 cm × 0.8 cm) on the root of mitral valve (Figure 1J). A definitive diagnosis of IE was reached. Day 12, fosfomycin sodium was replaced by linezolid (1.2 g/d) due to the temperature was still beyond 39.0°C. Day 15, the temperature decreased to normal. CT revealed gradually absorbed pulmonary consolidation in both lungs (Figure 1C). Day 23, vegetation reduced to 1.2 cm × 0.3 cm × 0.5 cm. Day 25, linezolid was stopped while daptomycin continued. Day 43, daptomycin was stopped. Day 46, the patient was discharged.

This study was reviewed and approved by the Ethics Committee of the Sixth People's Hospital of Shenyang (KY-LW-2021-02-01).

DISCUSSION

In the case described herein, IE was complicated by COVID-19. The COVID-19 pandemic has resulted in a decline in IE diagnosis approaching 35%.[6,7] Patients with IE are at a higher risk than ever before, and in addition, IE mortality has exceeded 20% under normal conditions.[8] To date, there is limited knowledge about COVID-19 combined with IE. The role played by viruses in the course of IE is complex, and no reports have directly described viruses as initiating factors.

In this case, IE was not considered due to the lack of any risk factors at the early stage. A high suspicion was made when the patient had additional presentations such as prolonged fever, positive blood culture, multiple embolic phenomenons, and focal neurologic deficit. Until vegetation visualized on TEE studies, the diagnosis of IE was more sufficient. The experience remained clinicians that IE should be highly alert to the patient with a high index of suspicion such as embolic phenomenon, focal neurologic deficit, decompensated heart failure, or new murmurs, despite any risk factors, just like this case.

MRSA was the pathogenic bacterium of IE in our report. According to drug sensitivity test, daptomycin was selected to control bloodstream infection for 42 d. Fosfomycin sodium and linezolid were successively combined with it for 10 d and 13 d, respectively, to treat intracranial and organ infection. The combination therapy was obviously effective. The blood culture was

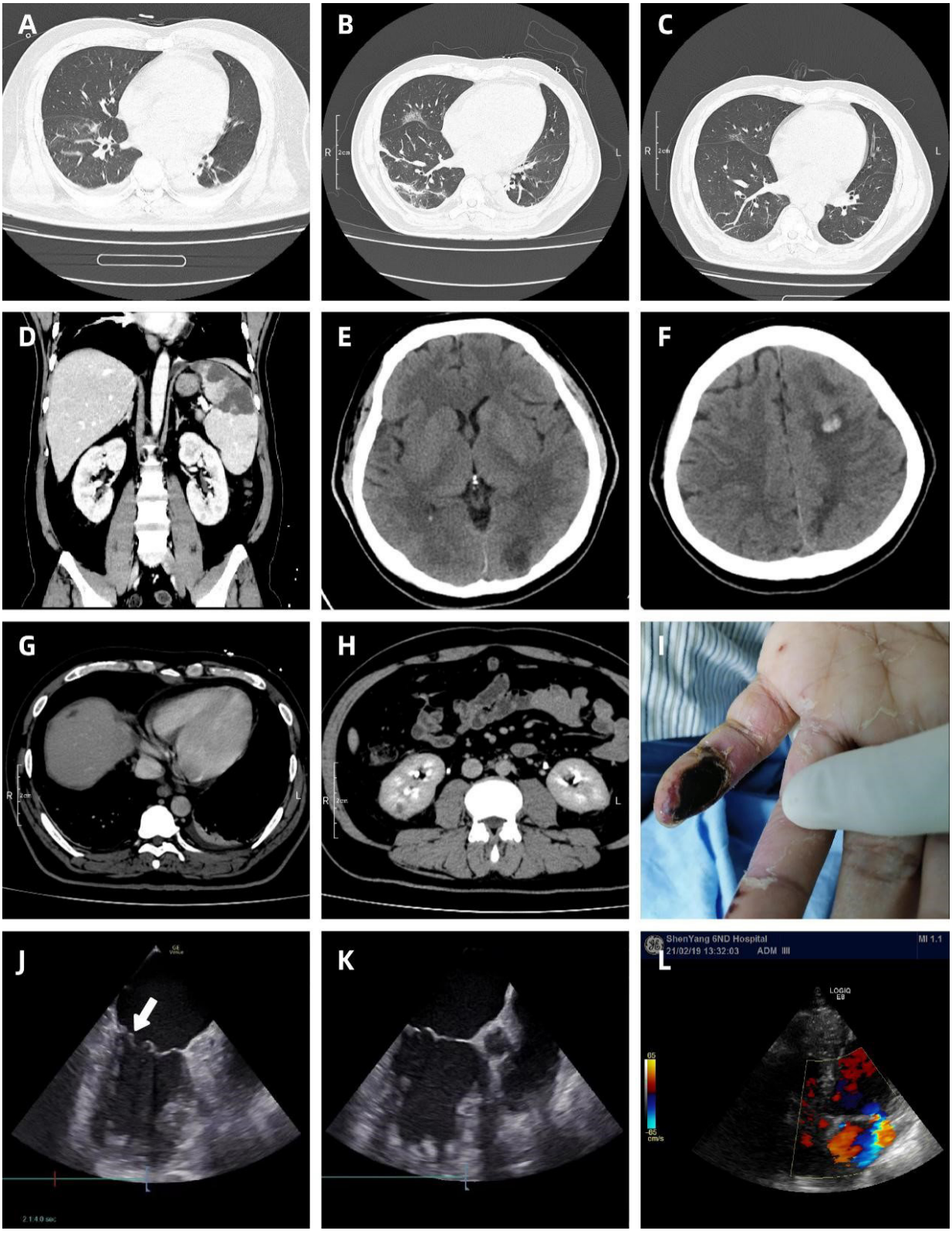

Figure 1. CT image. (A,B,C) The ground glass opacity of both lungs increased from a small amount to a patchy one with thickened blood vessels, and then to the inflammatory lesions. (D) Multiple splenic infarcts with the maximum diameter of 5.1 cm×3.6 cm and the tip pointed to splenic hilum. (E,F) Left parietal lobe hemorrhage and left occipital lobe infection with peripheral edema. (G) Low density necrosis in liver. (H) Low density small infarct in right kidney. (I) Necrosis of distal pinkie of left hand. Transoesophageal echocardiogram: (J) Vegetations in the heel of the left atrium near the posterior lobe of the mitral valve. (K) Mitral valve prolapse. Transthoracic echocardiogram: (L) Mitral valve regurgitation.

Table 1. Laboratory data, anti infective drugs and oxygen therapy mode

Date	clinical type	WBC ($\times 10^9$/L)	LC ($\times 10^9$/L)	CRP (mg/L)	IL-6 (pg/mL)	PCT (ng/mL)	LDH (U/L)	D- dimer (mg/L)	FIB (g/L)	ALT (U/L)	BIL (μmol/L)	PO2 (mmHg)	blood culture	O/N	dapto-mycin	fosfo-mycin	linez-olid	oxygen therapy mode
6 Jan	Moderate	15.8	1	185	34.3	1.36	716	2.72	5,31	111	47.6	66.4		31/31				nasal cannula
7 Jan		10	0.8	225	112	1.02	684	3.26	4.98	71	33.9	80.7	MRSA	28/28	0.8g Qd	8g 12h		nasal cannula
8 Jan		8.1	0.6	208			1075	4.62	4.71	57	21.3				0.8g Qd	8g 12h		nasal cannula
10 Jan		10	1.1	211	168	0.83	1005	3.47	3.15	65	19	73.1	(-)	33/32	0.8g Qd	8g 12h		nasal cannula
13 Jan		5.7	1.6	140.8	37.4		783	5.82	4.15	56	15.4	83	(-)	-/-	0.8g Qd	8g 12h		nasal cannula
15 Jan	Severe	5	1.2	97.69	70.1	0.28	760	7.52	4.71	45	13.1			-/-	0.8g Qd	8g 12h		noninvasive assisted ventilation
16 Jan		5.3	1.3	92.06		0.26	792	8.74	4.59	47	15.3	61.1	(-)		0.8g Qd	8g 12h		noninvasive assisted ventilation
17 Jan		5.2	1.4	92.07	53.5	0.1	779	9.5	4.84	43	17.2	56.2	(-)		0.8g Qd		0.6 12	noninvasive assisted ventilation
18 Jan		6.8	1.2	66.81	29	0.14	660	7.45	6.6	35	16				0.8g Qd		0.6 12	noninvasive assisted ventilation
19 Jan		7.5	1.3	59.7	41	0.11	626	5.87	5.87	63	19	74.1	(-)		0.8g Qd		0.6 12	noninvasive assisted ventilation
20 Jan	Moderate	7.7	1.4	68.66	27.1	0.13	616	5.33	7.41	152	20.8				0.8g Qd		0.6 12	nasal cannula
28 Jan		7.9	2.2	44.58	19.7	0.18	475	2	4.59	39	15.4			-/-	0.8g Qd		0.6 12	nasal cannula
29 Jan		7.7	2.2	29.1	15	0.15	393	1.79	6.6	35	15.4				0.8g Qd		0.6 12	nasal cannula
30 Jan		7.9	1.9	21.87	9.8	0.1	399	1.99	5.87	27	12.9				0.8g Qd			nasal cannula
17 Feb		6.8	2.5	2.28	1.5	0.05	388	0.99	3.59	29	9.8		(-)	-/-	Stop			
20 Feb	Discharge	6.8	2.1	3.57										-/-				

WBC: white blood cells, LC: lymphocytes, CRP: C-reactive protein, IL-6: interleukin-6, PCT: procalcitonin, LDH: lactate dehydrogenase, FIB: Fibrinogen, ALT: alanine amiotransferase, BIL: bilirubin, PO2: partial pressure of oxygen, O: open reading frame 1ab gene (ORF 1ab), N: nucleoprotein gene.

negative four days later, and body temperature was normal after one week. The size of vegetation decreased from 1.2 cm × 1.2 cm × 0.8 cm to 1.2 cm × 0.3 cm × 0.5 cm within two weeks. The infectious foci and Osler nodes were absorbed gradually.

Echocardiography (TTE and TEE) is an important tool for the diagnosis of IE. According to the American Society of Echocardiography (ASE) and the European Association of Cardiovascular Imaging recommendations,[9,10] TEE should be performed if a definitive diagnosis cannot be reached based on TTE findings when there is a high clinical suspicion for IE, despite the risk of infection. In this case, the vegetation was located on the posterior mitral leaflet near the base of the valve, which was not easily detected by TTE, and a definitive diagnosis was finally reached based on TEE performed under safety protection. TEE is also an important assessment modality to guide treatment. After 23 d combined treatment, vegetation was significatly reduced. On this basis, Fosfomycin sodium and linezolid were successively discontinued, only daptomycin lasted for 42 d. Surgical treatment was not required for the patient because the mitral valve structure was not severely damaged.

In summary, here this study reported the diagnosis and treatment of IE with COVID-19. The purpose of this report is to help clinicians by improving awareness of IE, particularly in COVID-19 patients.

Source of funding

Nil.

Ethics approval and consent to participate

This study was reviewed and approved by the Ethics Committee of the Sixth People's Hospital of Shenyang (KY-LW-2021-02-01).

Conflict of interest

Nil.

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