Complex case of COVID-19 and infective endocarditis

Katrin Alizadeh ,[1] Danielle Bucke,[2] Sadia Khan[3]

[1]Haematology, Chelsea and Westminster Hospital NHS Foundation Trust, London, UK
[2]Medicine, Chelsea and Westminster Hospital NHS Foundation Trust, London, UK
[3]Cardiology, Chelsea and Westminster Hospital NHS Foundation Trust, London, UK

Correspondence to
Dr Katrin Alizadeh;
katrin.alizadeh@nhs.net

Accepted 12 July 2021

SUMMARY

A 50-year-old man with no medical history of note presented with new onset of confusion and dyspnoea. He tested positive for coronavirus (COVID-19), and subsequently, was admitted to the intensive care unit due to severe sepsis and acute renal failure requiring haemodialysis. Shortly afterwards, he was intubated due to haemodynamic instability. His blood culture was positive for *Staphylococcus aureus* bacteraemia, and echocardiogram showed evidence of vegetation in the aortic valve area. He was commenced on intravenous antibiotics for infective endocarditis (IE). Following extubation, he underwent an MRI of the spine due to increasing back pain. This was suggestive of L5–S1 discitis, likely secondary to septic emboli from IE. A few days later, he developed acute ischaemia of the left toes and extensive thrombosis of the right cubital and left iliac veins. Following a prolonged hospital admission, he was discharged home and later underwent an elective forefoot amputation from which he made a good recovery.

BACKGROUND

COVID-19 is a rapidly evolving public health emergency, much of which is still unknown. This patient is a complex case of COVID-19 with infective endocarditis (IE) and prothrombotic tendencies.

Many publications have highlighted the importance of diagnosing and managing various cardiovascular complications from COVID-19 infection, including arrhythmias, acute coronary syndrome, myocarditis and deep venous thromboembolism (DVT). This case highlights the issue of IE and DVT in the setting of COVID-19 infection.

A focus of this case is highlighting the need to have a high clinical suspicion for alternative diagnoses when patients test positive for COVID-19. This includes sending a septic screen, blood culture, chest X-ray and urine culture in febrile patients.

CASE PRESENTATION

An otherwise healthy 50-year-old man presented to hospital with a 5-day history of worsening confusion, cough, fever and dyspnoea. He was not on any medication and his family history was unremarkable. On arrival to the emergency department, he was found to be hypoxic with an oxygen saturation of 79% (normal range >94%), hypothermic 35.2°C and hypotensive 96/58 mm Hg. His nasopharyngeal PCR test was positive for COVID-19. Initial blood tests showed evidence of sepsis with raised inflammatory markers, severe metabolic acidosis and severe acute renal failure. He was started on antibiotics and oxygen. He was treated for hyperkalaemia ranging between 7.9 and 9.8 mmol/L (normal range 3.5–5 mmol/L) and metabolic acidosis on multiple occasions; however, this remained refractory to treatment. He was therefore transferred to the intensive care unit (ICU) and underwent haemodialysis. He deteriorated while in the ICU and was intubated and ventilated. He was successfully extubated 3 days later.

Due to high clinical suspicion for sepsis from a concomitant bacterial infection, further investigations were undertaken. His blood culture was positive for *Staphylococcus aureus*; therefore, as advised by the microbiology team, a transthoracic echocardiogram (TTE) was performed which showed evidence of a vegetation in the aortic valve (figure 1). Echo showed good biventricular systolic function. He was started on intravenous flucloxacillin for IE as per local guidelines. A few days later, he developed worsening lower back pain that was refractory to analgesia. He underwent an MRI of the spine that showed L5–S1 discitis (figure 2). This was discussed at the multidisciplinary team meeting with the microbiologists, cardiologists and neurosurgical team. The discitis was thought to be due to septic emboli from IE and was decided to be treated conservatively with medical management. Two weeks later, the patient reported severe pain in the feet. On examination, he had digital ulcers on the right first and third toes and digital gangrene of all five toes on the left foot that was cold to touch. An X-ray of the left foot showed no acute abnormalities, but an ultrasound Doppler of the left leg demonstrated an extensive left iliac vein thrombosis. He was reviewed by the vascular team who felt this was likely an embolic complication of IE and/or due to COVID-19 infection.

Six days later, he developed swelling of the right arm; this was diagnosed as an acute thrombosis of the right cubital vein. After discussion with the haematology team, he was commenced on treatment dose heparin infusion. The vascular team planned for an elective forefoot amputation once the patient had stabilised and completed 6 weeks of intravenous antibiotics for IE as per microbiology advice.

INVESTIGATIONS

On admission, a nasopharyngeal PCR swab tested positive for SARS-CoV-2 infection and chest X-ray showed bilateral patchy infiltrates consistent with COVID-19 pneumonitis. CT scan of the head was performed to investigate the patient's new onset confusion but this was unremarkable. Admission blood tests showed a raised white cell count of 29×10^9/L (normal range $3.8–10.8\times10^9$/L) with lymphopenia of 0.4×10^9/L (normal range $0.8–3.9\times10^9$/L) and C reactive protein 288 mg/L (normal range <5 mg/L). His potassium was

To cite: Alizadeh K, Bucke D, Khan S. *BMJ Case Rep* 2021;**14**:e242205. doi:10.1136/bcr-2021-242205

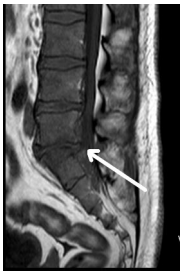

Figure 1 MRI of the spine showing a mild-moderate degree of fluid within the L5–S1 intervertebral disk suspicious for evolving discitis.

9.1 mmol/L (normal range 3.5–5 mmol/L), creatinine 885 µmol/L (normal range 55–120 µmol/L), urea 108 mmol/L (normal range: 2.5–7.8 mmol/L) and estimated glomerular filtration rate 5 mL/min/1.73 m^2 (normal range >89 mL/min/1.73 m^2). Ultrasound scan of the kidneys ureter and bladder showed no abnormality.

A CT of the chest, abdomen and pelvis was performed due to ongoing fevers which showed bilateral consolidation in the lungs with no other focus of infection. Due to worsening back pain, an MRI of the whole spine was performed which showed a mild-to-moderate degree of fluid within the L5–S1 intervertebral disk, with mild marrow oedema within the adjacent vertebral body endplates, suspicious for evolving discitis (figure 1).

TREATMENT

A 6-week course of intravenous flucloxacillin was completed in the community. For DVT, initially he was started on treatment dose heparin infusion due to poor renal function. This was switched to treatment dose low-molecular-weight heparin once renal function improved. This will be reviewed after 6 months in the haematology clinic.

OUTCOME AND FOLLOW-UP

The patient's confusion resolved on treating for sepsis. The patient was discharged to a rehabilitation unit for ongoing support and physiotherapy. Following this, he underwent the elective forefoot amputation and made a good recovery. He was followed up in the haematology and cardiology clinics and is making good progress.

DISCUSSION

There have been various reports in the literature highlighting the possible cardiovascular complications of COVID-19 infection, including arrhythmias, acute coronary syndrome, myocarditis and venous thromboembolism.[1 2] As with any acute illness, higher cardiometabolic demand can precipitate cardiac complications. However, there are few reported cases of IE and COVID-19 infection. Amir *et al* reported the first case of managing a patient with COVID-19 and IE; this was the case of a man who presented in March 2020 with a background of previous rheumatic heart disease.[3] A case report in Brazil discussed a patient who presented with septic emboli and was diagnosed with IE and COVID-19.[4] Since these case reports, there have been few other reports published, but any association remains largely unknown.

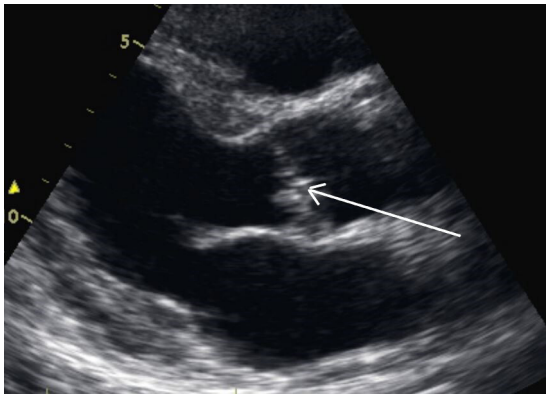

Figure 2 Transthoracic echocardiogram showing a small vegetation on aortic valve non-coronary cusp.

IE is a serious, life-threatening disease with an annual incidence of 3–7 per 100 000 patients each year.[5] There are many organisms that are thought to cause IE, but as in this case, *S. aureus* has become the most common causative organism for IE in most of the developed countries.[5 6] Echocardiography remains the gold standard of imaging in the diagnosis of IE. If there is high suspicion for IE, even in patients who are positive for COVID-19, echocardiography should be performed. This should be TTE in the first instance and transoesophageal echocardiography in patients where TTE is inconclusive.[7 8] The risk to the sonographer in carrying out echocardiography in patients with COVID-19 is high, in view of the close contact in completing the scan.[9] However, by wearing appropriate personal protective equipment, this can reduce the risks to the sonographer and can diagnose a potentially life-threatening disease for the patient.[9]

Treatment of IE requires prolonged antibiotic courses customised to the pathogens identified. *S. aureus* poses a treatment challenge due to antibiotic resistance, but antibiotics such as nafcillin are often chosen for the treatment of methicillin-susceptible *S. aureus*, whereas vancomycin is chosen for the treatment of methicillin-resistant *S. aureus*.[10 11] The exact choice and duration of antibiotic(s) will depend on local guidelines, according to the pathogen, antibiotic resistance and whether the infection is on a native or prosthetic valve. It is crucial that healthcare professionals remain vigilant of potential cardiovascular complications when treating for COVID-19. Delayed antibiotic therapy has serious adverse effects, including multiple organ dysfunction, sepsis and death.[12] Both COVID-19 and IE are associated with increased risk of thromboembolic events. A previous study found a dramatic fall in the risk of embolic events to the central nervous system after completing a week of antibiotics for IE.[13]

The use of anticoagulants in patients with IE and COVID-19 provides a clinical challenge. This is due to the thrombotic manifestations of COVID-19, with the use of prophylactic anticoagulation in hospitalised patients having become routine management. A scoping review found 20% of patients admitted to hospital with COVID-19 developed venous thromboembolism.[14] Whereas in patients with endocarditis, anticoagulation can increase morbidity and mortality; studies have found patients with endocarditis are at high risk of developing intracranial bleeding. A prospective study performed early cerebral MRI on patients with IE; it found haemorrhagic lesions in 8% and single or multiple microbleeds in up to 60% of patients.[15] It must be noted that this study identified cerebral lesions in many patients who did not have any neurological symptoms. Previous retrospective trials have also found a high risk of haemorrhagic stroke in patients with IE on anticoagulants. However, these studies have confounding factors, with the use of anticoagulants in patients with prosthetic valve endocarditis but not native valve endocarditis. Anticoagulation use is therefore a balancing act where the risks and benefits of treatment need to be assessed on a case-by-case basis.[16–18]

Twitter Katrin Alizadeh @Katrin Alizadeh

Learning points

- Have a high clinical suspicion for alternative diagnoses when patients test positive for COVID-19, including sending further investigations such as blood cultures and septic screen when febrile.
- It is important to be vigilant for the possible cardiovascular complications of COVID-19, including infective endocarditis.
- Despite the risks of contamination, if there is a high suspicion of infective endocarditis, then echocardiography is essential and gold standard for diagnosis, including in patients with COVID-19.
- Delayed antibiotic therapy in infective endocarditis has serious effects on morbidity and mortality.

Contributors KA identified the interesting aspects of the case and looked after the patient, under the supervision of SK. KA and DB studied the case, performed the literature review and drafted the manuscript. KA and SK were responsible for overall supervision of the project. All the authors contributed to, read and agreed with this submission.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

ORCID iD
Katrin Alizadeh http://orcid.org/0000-0002-2136-188X

REFERENCES

1 Clerkin KJ, Fried JA, Raikhelkar J, *et al*. COVID-19 and cardiovascular disease. *Circulation* 2020;141:1648–55.
2 Zhou F, Yu T, Du R, *et al*. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 2020;395:1054–62.
3 Amir M, Djaharuddin I, Sudharsono A, *et al*. COVID-19 concomitant with infective endocarditis: a case report and review of management. *Int J Infect Dis* 2020;98:109–12.
4 Dias CN, Brasil Gadelha Farias LA, Moreira Barreto Cavalcante FJ. Septic embolism in a patient with infective endocarditis and COVID-19. *Am J Trop Med Hyg* 2020;103:2160–1.
5 Baddour LM, Wilson WR, Bayer AS, *et al*. Infective endocarditis in adults: diagnosis, antimicrobial therapy, and management of complications. *Circulation* 2015;132:1435–86.
6 Kogler W, Omar M, Zoltowska D, *et al*. *Staphylococcus aureus* infective endocarditis: role of transoesophageal echocardiography. *BMJ Case Rep* 2020;13:e236530.
7 Habib G, Lancellotti P, Antunes MJ, *et al*. 2015 ESC guidelines for the management of infective endocarditis: the task force for the management of infective endocarditis of the European Society of cardiology (ESC). endorsed by: European association for Cardio-Thoracic surgery (EACTS), the European association of nuclear medicine (EANM). *Eur Heart J* 2015;36:3075–128.
8 Spinoni EG, Degiovanni A, Della Corte F, Corte FD, *et al*. Infective endocarditis complicating COVID-19 pneumonia: a case report. *Eur Heart J Case Rep* 2020;4:1–5.
9 Skulstad H, Cosyns B, Popescu BA, *et al*. COVID-19 pandemic and cardiac imaging: EACVI recommendations on precautions, indications, prioritization, and protection for patients and healthcare personnel. *Eur Heart J Cardiovasc Imaging* 2020;21:592–8.
10 Chang F-Y, Peacock JE, Musher DM, *et al*. *Staphylococcus aureus* bacteremia: recurrence and the impact of antibiotic treatment in a prospective multicenter study. *Medicine* 2003;82:333–9.
11 Wang A, Gaca JG, Chu VH. Management considerations in infective endocarditis: a review. *JAMA* 2018;320:72–83.
12 Lodise TP, McKinnon PS, Swiderski L, *et al*. Outcomes analysis of delayed antibiotic treatment for hospital-acquired *Staphylococcus aureus* bacteremia. *Clin Infect Dis* 2003;36:1418–23.
13 Dickerman SA, Abrutyn E, Barsic B, *et al*. The relationship between the initiation of antimicrobial therapy and the incidence of stroke in infective endocarditis: an analysis from the ice prospective cohort study (ICE-PCS). *Am Heart J* 2007;154:1086–94.
14 Al-Ani F, Chehade S, Lazo-Langner A. Thrombosis risk associated with COVID-19 infection. A scoping review. *Thromb Res* 2020;192:152–60.
15 Duval X, Iung B, Klein I, *et al*. Effect of early cerebral magnetic resonance imaging on clinical decisions in infective endocarditis: a prospective study. *Ann Intern Med* 2010;152:497–504.
16 Vanassche T, Peetermans WE, Herregods M-C, *et al*. Anti-Thrombotic therapy in infective endocarditis. *Expert Rev Cardiovasc Ther* 2011;9:1203–19.
17 Delahaye JP, Poncet P, Malquarti V, *et al*. Cerebrovascular accidents in infective endocarditis: role of anticoagulation. *Eur Heart J* 1990;11:1074–8.
18 Liesenborghs L, Meyers S, Vanassche T, *et al*. Coagulation: at the heart of infective endocarditis. *J Thromb Haemost* 2020;18:995–1008.