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SHORT REPORT

An overview of infective endocarditis in the context of COVID-19 pneumonia

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Abstract

Infective endocarditis (IE) in the context of coronavirus disease (COVID-19) is an emerging clinical entity. If not identified timeously, it is associated with high morbidity and mortality. Herein, we provide an overview of the literature supported by a clinical vignette, and highlight the importance of early recognition and management of IE in the context of COVID-19 infection.

Keywords COVID-19 pneumonia • infective endocarditis • echocardiography • clinical vignette • surgery

Introduction

There have been recent reports of infective endocarditis (IE) in the context of coronavirus disease (COVID-19) pneumonia.[1–4] IE carries a high mortality rate if not recognized early and treated.[5] The goal of this clinical vignette and brief review is to alert the clinician to actively search for IE in a patient with sepsis and a history of COVID-19 pneumonia, thus enabling early diagnosis and treatment.

Clinical vignette

An 80-year-old obese (body mass index 31 kg/m^2) female with multiple comorbidities presented in August 2021 with dyspnoea and fatigue to a private hospital. She had a pacemaker insertion in January 2021 and was hospitalized for COVID-19-related pneumonia in May 2021 and was treated with corticosteroids. In the current admission, she had an elevated D-dimer and low oxygen saturation on room air of 82% and thus underwent a computed tomography of the chest, which confirmed suspicion of pulmonary thromboembolic disease (*Figure 1*). During the same admission 2 weeks later, she was consulted for a non-resolving fever and suspected device-related IE based on positive *Candida auris* blood cultures and peripheral emboli to the right foot. Prior to a definitive diagnosis of fungal endocarditis, she was initially started with piperacillin/tazobactam and amikacin. She was later switched to micafungin following the results of microscopy, culture, and sensitivity analyses.

On examination, she was noted to be frail but haemodynamically stable and not in congestive heart failure. Her blood biochemistry was consistent with acute sepsis. A transthoracic echocardiogram and transoesophageal echocardiogram (TEE) were performed to exclude lead-related IE (*Figure 2*). The left and right ventricular dimensions and function were preserved with an ejection fraction of 66% and a transannular plane excursion of 22 mm. There was a 40.5 mm × 18 mm vegetation on the anterior mitral valve (MV) leaflet and a 10 mm vegetation on the posterior mitral leaflet complicated by an abscess formation adjacent to the posteromedial commissure. There was mild eccentric mitral regurgitation with a posteriorly directed jet. The right ventricular systolic pressure measured 33 mmHg. All other valves were normal and the lead was spared.

Based on Dukes' criteria, she was assessed as having an acute fungal IE of the MV and referred for urgent surgery. Intra-operative findings and histology confirmed acute fungal IE involving the MV (*Figure 3*).

She completed a 6-week course of intravenous micafungin (100 mg i.v. daily) during her prolonged intensive care admission and showed good clinical recovery, following which she was discharged home. Two months later, she presented with a relapse of fungal IE on the

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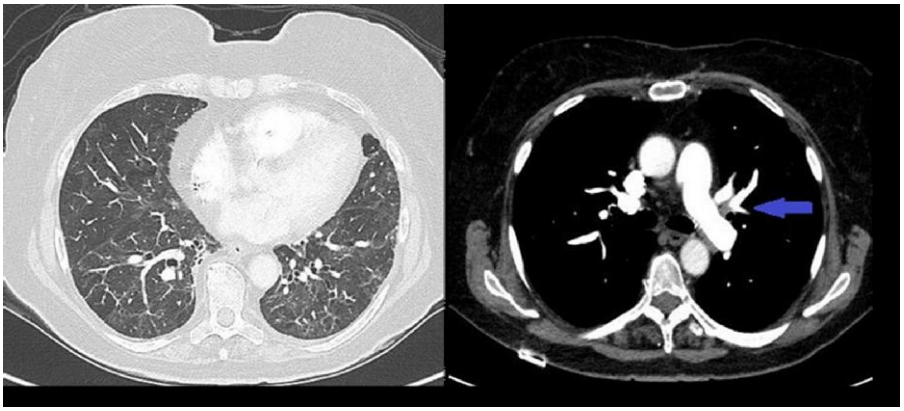

Figure 1 Computed tomography scan of the chest showing prominent broncho-vascular markings and bronchiectasis changes in the basal lung fields (left) and branch pulmonary artery emboli (right, arrow).

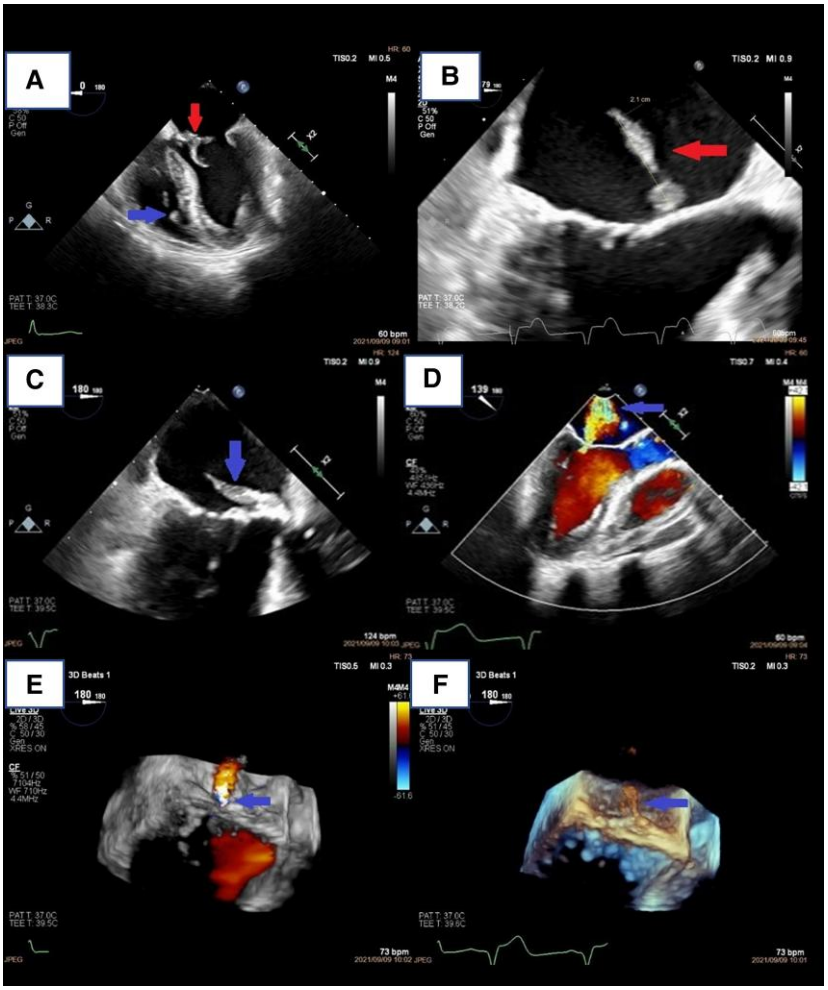

Figure 2 (*A* and *B*) Four-chamber view showing intact right ventricular lead (bottom horizontal arrow) and vegetation on the anterior MV leaflet (top arrow). (*C* and *D*) Large vegetation on the anterior mitral leaflet (*C*) complicated by mitral regurgitation (*D*). (*E* and *F*) Three-dimensional colour Doppler demonstrating mitral regurgitation (*E*) and large vegetation (*F*).

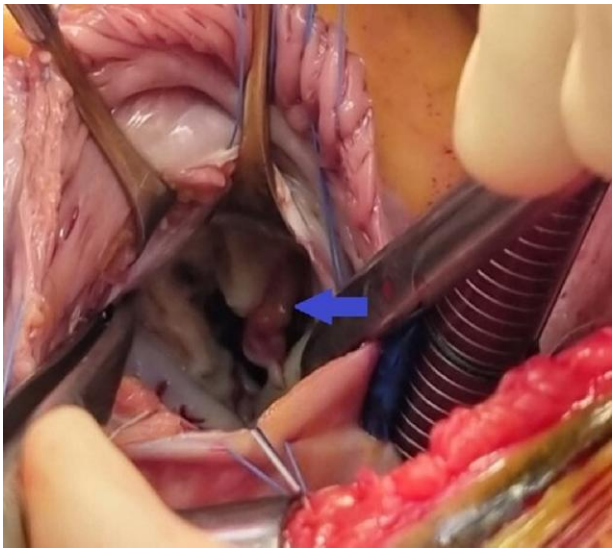

Figure 3 Surgical view of the MV showing vegetation on the anterior MV leaflet (arrow).

bioprosthesis. After a discussion with the heart team, a second surgical intervention was deferred because of her frail condition and she was treated medically. Subsequently, she became severely septic and died.

Discussion

The pathophysiology of IE in the context of COVID-19 infection is multifactorial and direct causality has not been definitively proved. The postulated causes are host factors such as comorbidities, advanced age, bacterial superinfection, autoimmune mechanisms, direct myocardial injury by the virus, hypercoagulable state, use of immunosuppressant therapeutics such as steroids, as in this case, and risk factors associated with prolonged hospitalization such as nosocomial sepsis and prolonged use of antibiotics.[1–3]

IE in the setting of COVID-19 is considered rare, with a reported incidence rate of 0.1% in a European multicentre study.[4] The low rate of incidence in the study may be related to underdiagnosis due to contraindication for TEE in patients with COVID-19.[5] In a single-centre South African study by Meel and Van Blydenstein,[6] the incidence rate of IE in the context of COVID-19 pneumonia was found to be higher at 5.5%.

In the context of COVID-19 with a heightened inflammatory response and myriad of overlapping clinical signs with IE, this entity can be easily missed.[7] Our patient had multiple comorbidities and a device *in situ* with a history of steroid use and hospitalizations, which increased her susceptibility to IE. At which point in time she acquired *C. auris* endocarditis is difficult to discern, as no blood culture test or prior echocardiography examination was performed. Perhaps an echocardiography during admission for COVID-19 may have revealed vegetation on the lead prior to the development of severe sepsis and peripheral embolization.

Candida-related endocarditis is rare, implicated in <2% of patients with IE.[8] It is associated with a high in-hospital mortality rate of >30%. *Candida auris* has only recently emerged as a pathogen responsible for human infections.[9] Its emergence has been related to the misuse of antifungals, antibiotics, and poor hygiene in the hospital setting. It is a highly virulent organism due to its ability to form biofilms and resistance to traditional anti-fungal agents. It is associated with high mortality and treatment failure in an immunocompromised patient with multiple comorbidities. Therefore, rapid identification and urgent surgical referral of patients with IE secondary to *C. auris* is mandatory. For native valve endocarditis, valve replacement is recommended and treatment with amphotericin B or high-dose echinocandin such as micafungin should continue for at least 6 weeks after surgery.[10]

In the context of COVID-19 infection, it is important to be mindful of other differentials such as marantic endocarditis or non-bacterial thrombotic endocarditis.[11] COVID-19 infection causes a pro-inflammatory state with cytokine storm, which contributes to local tissue destruction and resultant thrombus vegetation formation on the disrupted areas. In the context of negative blood culture results, marantic endocarditis must be considered in a patient with COVID-19 infection as it is responsive to anticoagulants.

Conclusion

IE in an elderly patient with multiple comorbidities and a history of COVID-19 infection must remain an important consideration. There is an overlap between the clinical signs associated with IE and COVID-19 pneumonia and hence the clinician must remain vigilant for this condition. The threshold for bedside echocardiography must be low in a patient with sepsis and a history of recent hospitalization with COVID-19 pneumonia.

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Consent

The patient's consent was obtained for the publication of this clinical vignette during her first hospitalization.

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Conflict of interest: None declared.

Data availability

The data that support the findings of this report are available from the corresponding author upon reasonable request.

Lead author biography

Dr Ricardo Goncalves is a senior consultant cardiologist practising at the Life the Glynnwood Hospital in Benoni, South Africa. He obtained his undergraduate degree from the University of Pretoria. He subsequently obtained his master's degree (*Cum Laude*) in Internal Medicine and further sub-specialized in Cardiology. His main interests are interventional cardiology, heart failure treatment, and syncope management.

References

1. Kariyanna PT, Jayarangaiah A, Dulal J, Jayarangaiah A, Das S, Punnakudiyil GJ *et al.* Infective endocarditis and COVID 19: a systematic review. *Am J Med Case Rep* 2021; **9**:380–5.

2. Bajdechi M, Vlad ND, Dumitrascu M, Mocanu E, Dumitru IM, Cernat RC *et al.* Bacterial endocarditis masked by COVID-19: a case report. *Exp Ther Med* 2022; **23**:186.
3. Blagova O, Kogan EA, Lutokhina YU, Kukleva AD, Sedov VP. Post-COVID morphologically proved endocarditis: infective and nonbacterial forms. *Eur Heart J* 2021;**42**: ehab724-1725.
4. Linschoten M, Peters S, van Smeden M, Jewbali LS, Schaap J, Siebelink HM *et al.* Cardiac complications in patients hospitalised with COVID-19. *Eur Heart J Acute Cardiovasc Care* 2020;**9**:817–23.
5. Cosyns B, Motoc A, Arregle F, Habib G. A plea not to forget infective endocarditis in COVID-19 era. *JACC Cardiovasc Imaging* 2020;**13**:2470–1.
6. Meel R, Van Blydenstein SA. Demographic, clinical, electrocardiographic, and echocardiographic characteristics of patients hospitalized with COVID-19 and cardiac disease at a tertiary hospital, South Africa. *Cardiovasc Diagn Ther* 2021;**11**: 1228–40.
7. Amir M, Djaharuddin I, Sudharsono A, Ramadany S. COVID-19 concomitant with infective endocarditis: a case report and review of management. *Int J Infect Dis* 2020; **98**:109–12.
8. Huggins JP, Hohmann S, David MZ. Candida infective endocarditis: a retrospective study of patient characteristics and risk factors for death in 703 United States cases, 2015–2019. *Open Forum Infect Dis* 2020;**8**:ofaa628.
9. Sabino R, Veríssimo C, Pereira ÁA, Antunes F. *Candida auris*, an agent of hospital-associated outbreaks: which challenging issues do we need to have in mind? *Microorganisms* 2020;**8**:181.
10. Pappas PG, Kauffman CA, Andes DR, Clancy CJ, Marr KA, Ostrosky-Zeichner L *et al.* Clinical practice guideline for the management of candidiasis: 2016 update by the Infectious Diseases Society of America. *Clin Infect Dis* 2015;**62**:e1–50.
11. Chan KH, Joseph O, Ahmed E, Kommidi A, Suleiman A, Szabela ME *et al.* Marantic endocarditis associated with COVID-19: a rare case report of a potentially deadly disease. *Eur J Case Rep Intern Med* 2021;**8**:002409.