

## CASE REPORT

## Management of Infective Endocarditis and Tibioperoneal Mycotic Aneurysm Following COVID-19 Infection

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**Introduction:** Infective endocarditis and mycotic tibioperoneal aneurysms are rare complications of COVID-19 infection. Medical therapy may not always be sufficient to reduce the high morbidity and mortality associated with these cardiovascular complications. Surgical treatment may need to be considered in such patients.

**Report:** A 56 year old male patient with diabetes, hypertension, and hyperlipidaemia developed severe pneumonia from COVID-19 infection. He was admitted to the intensive care unit (ICU) at another facility where he was ventilated for a period of six weeks. Blood culture isolated coagulase-negative *Staphylococcus* and an echocardiogram showed a 1.4 × 1.5 cm mitral valve vegetation. He was treated for a period of 12 weeks with various antibiotic combinations including meropenem, levofloxacin, and teicoplanin with no improvement. On presentation at the current centre, he complained of painful right calf swelling. Computed tomography angiography showed a 7 cm right tibioperoneal trunk aneurysm. He underwent lung and cardiac assessment, following which it was decided to proceed with one stage synchronous surgery. Cardiac surgery was started through a median sternotomy and Guiraudon transeptal approach, with mitral valve replacement using a bioprosthesis (Edwards Magna, size 29). This was immediately followed by a medial lower limb approach with ligation of the aneurysm, followed by arterial reconstruction using a reversed saphenous vein graft from the superficial femoral artery to the posterior tibial artery. He was placed on intravenous vancomycin and ceftriaxone for a period of six weeks. He was discharged home after day 31 on 75 mg aspirin daily. At six month follow up, he was symptom free with a palpable posterior tibial pulse.

**Discussion:** Increased awareness and close surveillance are necessary for patients with severe COVID-19 infection. In those who develop unusual cardiovascular complications, one stage cardiac and vascular surgery may be feasible, as described in this case.

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### INTRODUCTION

Coronavirus (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-COV-2). There have been several reports of cardiovascular complications associated with COVID-19 infection. Much of the evidence suggests that this is related to endothelial injury from loss of angiotensin converting enzyme activity and direct actions of angiotensin II.<sup>1</sup> In addition, an inflammatory pathway leading to cell injury through a complex array of cytokine recruitment, activation of prothrombin factors, coagulation cascades, and complement mediated microvascular

thrombosis has been described.<sup>2</sup> While thrombotic vascular complications have been well documented, non-thrombotic vascular complications, such as infective endocarditis and peripheral aneurysms, have received less attention.

This case study presents a patient who developed severe COVID-19 infection complicated by infective endocarditis and tibioperoneal trunk mycotic aneurysm.

### CASE REPORT

A 56 year old male patient attended another facility with fever and difficulty breathing. His past medical history was significant for diabetes, hypertension, and hyperlipidaemia. He tested positive for COVID-19 and was admitted to the intensive care unit (ICU). He was intubated shortly afterwards due to respiratory deterioration and required ventilation for six weeks. After a brief period of clinical improvement, he developed persistent temperature spikes and fatigue symptoms. Blood culture isolated coagulase-

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negative *Staphylococcus*, and an echocardiogram showed a  $1.4 \times 1.5$  cm mitral valve vegetation. He received various antibiotic combinations including meropenem, levofloxacin, and teicoplanin for a total of three months with no resolution of his fever or the mitral valve vegetation. He was referred to the current centre for relevant expertise and further management.

On presentation, the patient complained of right leg pain and calf swelling. Vital signs included a pulse of 90 bpm, blood pressure of 122/77 mmHg, respiratory rate of 20 breaths/minute, and temperature of 38.5 °C. Physical examination revealed a pansystolic murmur over the mitral valve area and bilateral coarse inspiratory crepitations. His right calf was swollen, and he could not move his ankle due to pain and weakness. Left leg pulses were normal but right foot pulses were impalpable. Blood laboratory investigations revealed elevated inflammatory parameters, with a white blood cell count of  $13 \times 10^9/L$ , C reactive protein of 341 mg/L, and haemoglobin level of 7.1 g/dL. Based on the clinical presentation, his antibiotic therapy was changed to a combination of vancomycin and ceftriaxone.

The patient underwent pre-operative full body computed tomography angiography, which showed a right  $7 \times 7.5$  cm (transverse diameter) tibioperoneal trunk aneurysm (Fig. 1). Transoesophageal echocardiogram examination showed a posterior mitral valve leaflet vegetation measuring  $1.7 \times 1.6$  cm and moderate eccentric mitral regurgitation. As no improvement was obtained with prolonged antibiotic therapy, it was decided that open surgical repair was indicated for both lesions. He underwent lung and cardiac assessment and was considered fit for surgery. Considering the potential risk of re-infection from retained infected

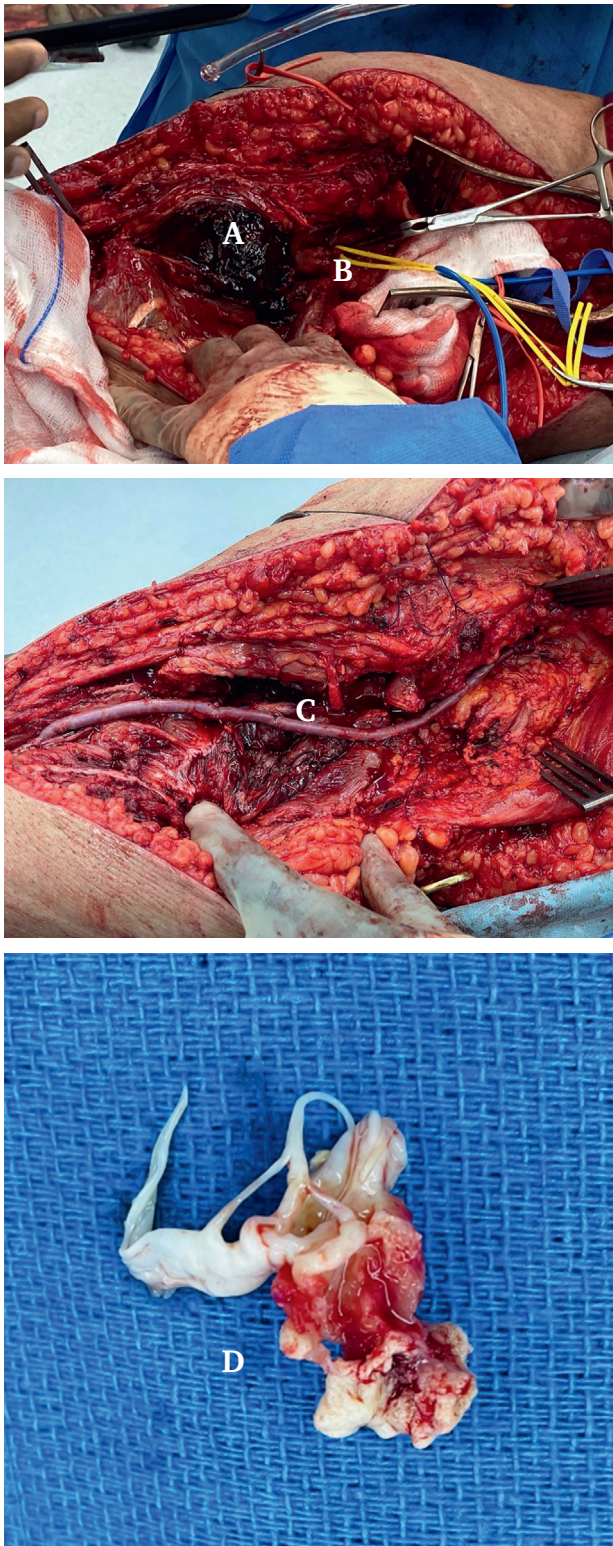
tissue that would occur with a two stage procedure, a combined one stage operation was opted for.

Cardiac surgery was through a median sternotomy. Heparin was given at 3 mg/kg to reach an activated clotting time of  $>400$  seconds. The patient was placed on a heart–lung machine. An extended vertical transatrial–septal approach was performed to expose the mitral valve. There was a large amount of vegetation on the posterior leaflet (Fig. 2). It was decided that replacement with a bioprosthesis (Edwards Magna, size 29) was the best option for the patient to reduce infective complications and out of concern that he would not comply with long term anticoagulation. The heparin was reversed with protamine.

After sternotomy closure and he was off pump, the peripheral aneurysm was immediately repaired. The operative approach included harvest of the right saphenous vein and exposure of the distal superficial femoral artery (SFA). The posterior tibial artery was exposed at the midcalf because it was of good calibre and easily accessible. Once proximal control was obtained at the distal SFA, the aneurysm was approached through a medial incision. The aneurysm was then opened and an organised thrombus without pus was observed and evacuated. The aneurysm was ligated using a transfixing suture within the sac, and the distal popliteal artery was ligated above the aneurysm. Vascular reconstruction was performed with a reversed saphenous vein graft, with an end to side proximal anastomosis to the distal superficial femoral artery. The vein graft was then tunnelled anatomically to the midcalf and anastomosed end to side to the PTA (Fig. 2). There was good distal flow along the PTA documented with intra-operative handheld Doppler examination. No microorganisms were recovered from either the



**Figure 1.** Computed tomography angiography showing a right tibioperoneal trunk aneurysm.



**Figure 2.** Intra-operative pictures showing the opened aneurysm sac (A), Loop around the distal popliteal artery (B), vein bypass (C) with the distal anastomosis on the posterior tibial artery, mitral valve with vegetations removed during surgery (D).

mitral vegetations or the thrombus from within the aneurysm sac. He was placed on 75 mg aspirin and 10 mg atorvastatin daily post-surgery.

The cardiac surgery stage took 3 hours and 31 minutes, and the vascular surgery took 3 hours 30 minutes. Total blood loss was 300 mL. He was extubated on post-operative day two and discharged from ICU on day seven. He was discharged from hospital on day 31 mainly due to difficulty with mobilisation and the need to complete intravenous antibiotic therapy for a period of six weeks. Echocardiography showed a normal functioning mitral valve at five months. At six months follow up, he was free of symptoms and had a palpable right PTA pulse at the ankle. He was advised to remain on 75 mg aspirin once daily.

## DISCUSSION

Infective endocarditis is a severe and potentially life threatening disease. A number of reports implicating virus related endocardial damage, frequent use of immunosuppressive drugs, sepsis from a chest infection, and prolonged ICU admission have described an association between COVID-19 infection and infective endocarditis.<sup>3</sup> In the current literature review of COVID-19 infection associated infective endocarditis, 30 cases have been reported to date;<sup>3-8</sup> 73% of these patients had pre-existing cardiovascular disease.

Peripheral embolic complications have been reported in nine other cases (Table 1) of COVID-19 associated infective endocarditis.<sup>9-16</sup> Peripheral mycotic aneurysms are rare but serious complications of infective endocarditis. They may suddenly become symptomatic, usually from acute rupture, or develop a more gradual course, as in the current patient. This case is the first reported case of a peripheral embolic complication resulting in a mycotic aneurysm in a patient with COVID-19 associated infective endocarditis.

Previous reports have shown synchronous aortic and non-vascular surgery to be safe.<sup>17</sup> However, there is limited publication regarding the most appropriate management of coexisting cardiac and vascular surgical pathology. In a recent retrospective review, Haywood et al. concluded that patients undergoing concurrent carotid endarterectomy and coronary artery bypass, compared with a staged procedure, were less likely to have adverse cardiovascular events in the peri-operative period.<sup>18</sup>

The decision to proceed with a combined one stage procedure was based on the belief that a staged procedure would retain potential infected tissue in a place that risks re-infection, further compromising or delaying the patient's recovery. In addition, it was believed that the patient's right leg pain was partly due to nerve compression to the tibial and peroneal nerves, as was evident in the weakness observed in his foot. Staged surgery would have delayed early post-operative mobilisation but would also have risked rupture of the aneurysm in the peri-operative period. Combined single stage surgery has been described in one patient with COVID-19 infective endocarditis: De Castro et al. reported the case of a 30 week pregnant patient with COVID-19 associated infective endocarditis and multiple septic cerebral emboli managed by emergency caesarean delivery followed by mitral valve repair.<sup>9</sup>

**Table 1.** Published cases of COVID-19 associated infective endocarditis and peripheral embolic complications.

Author (year)	Age/Sex	Clinical presentation	Affected valves	Microbiology	Dissemination	Antibiotic regimen	Surgical management	Outcome
De Castro et al. (2019) <sup>9</sup>	34/F	30 weeks pregnant, fever, headaches	Mitral valve	<i>Haemophilus parainfluenza</i>	Cerebral infarct	Vancomycin, ampicillin, acyclovir, ceftriaxone for four weeks	Emergency Caesarian delivery and mitral valve repair	Discharged
Regazzoni et al. (2020) <sup>10</sup>	70/M	Bilateral pneumonia, fever, stroke	Aortic valve	<i>Staphylococcus aureus</i>	Cerebral infarcts	NA	NA	Discharged
Choudhury et al. (2020) <sup>11</sup>	73/M	Fever	Bioprosthetic aortic valve	<i>Methicillin-sensitive Staphylococcus aureus</i>	Epidural abscess	Vancomycin, piperacillin/tazobactam, daptomycin, rifampin	No	Discharged to hospice
Kwon et al. (2020) <sup>12</sup>	65/M	Pneumonia, right sided hemiparesis	Mitral valve	<i>Pseudomonas aeruginosa</i>	Cerebral infarct	Piperacillin/tazobactam	No	Discharged
Alizadeh et al. (2021) <sup>13</sup>	50/M	Fever, confusion, dyspnoea	Aortic valve	<i>Staphylococcus aureus</i>	Left foot ischaemia, L5–S1 discitis	Flucloxacillin for six weeks	Left forefoot amputation	Discharged
Lowell et al. (2021) <sup>14</sup>	59/M	Fever and abdominal cramps	Mitral valve	<i>Streptococcus agalactiae</i>	Splenic infarct	Ceftriaxone	Mitral valve replacement	Discharged
Sakata et al. 2022 <sup>15</sup>	34/F	Fever, cough, chest pain	Mitral valve	<i>Staphylococcus aureus</i>	Left circumflex coronary branch occlusion, right renal artery occlusion, cerebral infarct	Vancomycin, cefazolin	Mitral valve replacement	Discharge day 25
Taghizadeh-Waghefi et al. (2023) <sup>16</sup>	76/M	Sepsis, stroke	Aortic valve	<i>Methicillin-susceptible Staphylococcus aureus</i>	Cerebral infarct	NA	Aortic valve replacement	Discharged
Taghizadeh-Waghefi et al. (2023) <sup>16</sup>	67/M	Fever, sepsis, stroke	Mechanical mitral valve	<i>Methicillin-susceptible Staphylococcus aureus</i>	Cerebral infarct	NA	Mitral valve replacement	Discharged

NA = not available.

Isolated tibioperoneal trunk aneurysms are rare and, as such, there is a lack of consensus regarding the indication for surgical repair. Berchiolli et al. described the case of a 65 year old male with COVID-19 infection who developed pneumonia and pulmonary embolism.<sup>19</sup> At six months, an incidental 25 mm popliteal artery aneurysm was found on routine lower limb Duplex scan imaging; he underwent surgical dissection, aneurysmorrhaphy, and vein graft interposition. No complications occurred, and the patient was placed on lifelong single antiplatelet therapy. The authors did not mention whether a diagnosis of infective endocarditis was considered at the time of his initial COVID-19 infection. Perhaps this may be explained by the fact that transoesophageal echocardiogram is considered an aerosol generating procedure, and access to this investigation was not always possible during the COVID-19 pandemic.

The anatomical location of tibioperoneal aneurysms can preclude safe repair. Ventarola et al. described a hybrid approach in a 50 year old male with a 4.1 cm tibioperoneal trunk aneurysm who presented with neurological compromise from compartment syndrome.<sup>20</sup> They chose to avoid aneurysmorrhaphy for fear of further tissue damage, but performed a four compartment fasciotomy, surgical bypass to the anterior tibial artery, and coil embolisation of origins of the anterior tibial, posterior tibial, and peroneal arteries. Aziz reported an entirely endovascular approach by placement of a Viabahn balloon expandable stent graft (W. L. Gore & Associates, Flagstaff, AZ, USA) across a tibioperoneal trunk aneurysm.<sup>21</sup> They had to sacrifice the peroneal artery to achieve a satisfactory landing zone in the posterior tibial artery. At six months, the aneurysm remained excluded, but poor long term patency concerns prompted the authors to keep the patient on a long term combination of warfarin and aspirin. Particularly in small aneurysms, if the collateral circulation is deemed adequate, ligation and excision of the aneurysm has been described.<sup>22</sup>

In conclusion, this case study reports a patient with COVID-19 associated infective endocarditis complicated by contained rupture of a 7 x 7.5 cm tibioperoneal trunk aneurysm. A one stage mitral valve replacement and open surgical aneurysm repair can be an effective and safe strategy in selected cases.

#### APPENDIX A. SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ejvsf.2023.09.005>.

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