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Ruptured Popliteal Artery Aneurysm Complicated with Acute Respiratory Distress Syndrome Secondary to SARS-CoV-2 Infection

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We herein report a rare case of the ruptured popliteal artery aneurysm in an 89-year-old man, whose recovery after surgical treatment was complicated with acute respiratory distress syndrome secondary to confirmed infection with SARS-CoV-2. Presenting symptoms, patient's comorbidities, and postoperative course complicated with cardiac and respiratory failure leading to adverse outcome are discussed in this case report.

Popliteal artery aneurysms (PAAs) account for more than 80% of all peripheral arterial aneurysms with prevalence in men.[1,2] PAA is the most often treated extracranial aneurysm (apart from the aorta) and thus constitutes an important clinical condition.[3,4] The most common complications encompass distal embolization and thrombosis, leading to acute or chronic limb-threatening ischemia. Rupture of PAA is rare and accounts for between 2% and 5% of cases in large series.[5] It mainly occurs in large or septic aneurysms and many years after successful surgical exclusion.[6]

Herein, we present a case of ruptured PAA leading to acute limb ischemia in a patient who developed rapidly progressing chest infection secondary to SARS-CoV-2 infection.

Coronavirus disease-2019 (COVID-19) is a respiratory disease caused by SARS-CoV-2. Clinical manifestation of COVID-19 varies from asymptomatic, acute respiratory distress to pneumonia of varying degrees of severity.[7] It primarily spreads through the respiratory tract by droplets, respiratory secretions, and direct contact. COVID-19 is deemed to be highly contagious during its latency period and is highly transmittable in humans. Its median incubation period has been estimated to be 3 days but can be as long as 24 days.[7,8]

CASE REPORT

An 89-year-old man was admitted under the medical team after a head injury he sustained as a result of a fall at home. On admission, he complained of right knee swelling and difficulty in bearing weight on that limb. His past medical history included severe chronic obstructive pulmonary disease (COPD), chronic kidney disease with an estimated glomerular filtration rate of 32 mL/min, transient ischemic stroke, ischemic heart disease, and atrial fibrillation. His ambulation was limited by shortness of breath, and his mobility was mainly limited to domiciliary activity.

On the second day of his admission, a postural hypotension and concomitant drop in the hemoglobin level

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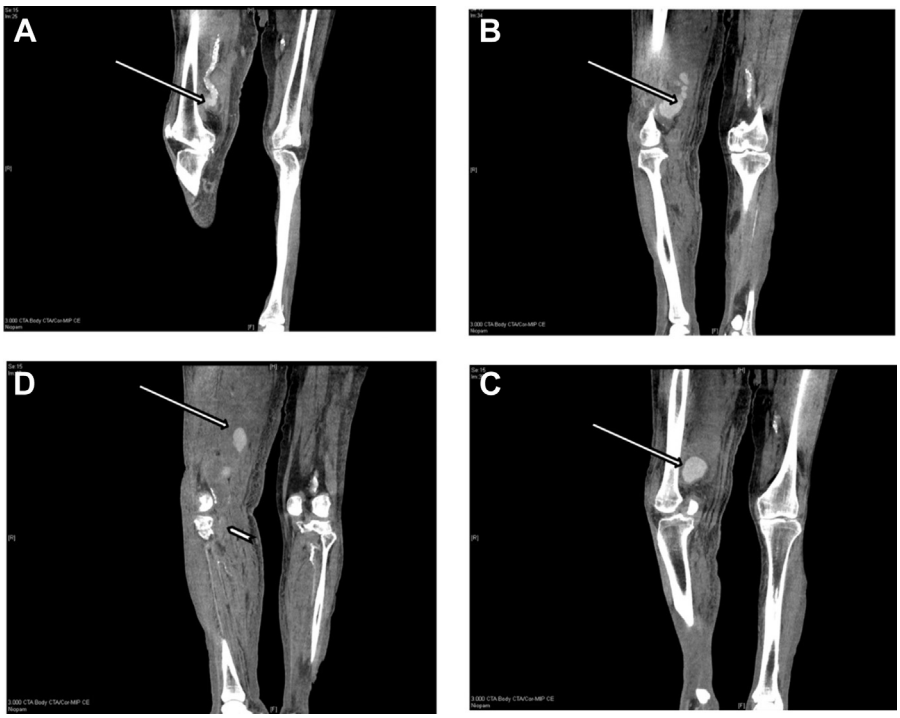

Fig. 1. (A) White long arrow pointing to proximal end of PAA; **(B)** Long white arrow pointing to the rupture site of PAA; **(C)** Long white arrow pointing the posterolateral extent of PAA; **(D)** Long white arrow pointing to intramuscular hematoma and short white arrow pointing to occluded distal part of PAA. PAA, popliteal artery aneurysm.

were recognized. A computed tomography (CT) of his chest, abdomen, and pelvis was performed to identify a potential source of blood loss. The CT scan demonstrated hematoma in the medial compartment of the right thigh. Subsequently, an arterial phase CT scan of the lower limbs identified a 6.3-cm ruptured PAA (P1 segment of the right popliteal artery) with distal thrombosis and with a significant hematoma in the medial and posterior thigh compartments (Fig. 1). He was also diagnosed with an incidental 47-mm infrarenal abdominal aortic aneurysm. The patient was promptly referred to the vascular surgeons.

On assessment by vascular surgeons, the patient appeared frail, with shortness of breath at rest (saturation on room air was 95%), complaining of rest pain in the right foot and in the thigh. The right foot was viable although with reduced sensation and motor function (IIB Rutherford classification). He also had extensive swelling of the thigh and bruising involving the medial and posterior aspect of the right thigh. A bedside arterial duplex scan confirmed absence of flow distal to the ruptured PAA.

A review by the anesthetist highlighted a significant risk of mortality with either operative revascularization or primary amputation. The patient was very keen on surgical intervention (rather than palliation), and after a detailed discussion with him and his family (based on his extensive medical background and frailty), an above-knee amputation was carried out under spinal anesthesia.

He suffered a non-ST elevation myocardial infarction the following day, for which he was treated in accordance with the local acute coronary syndrome protocol. The electrocardiogram showed T wave inversion in V4 to V6 leads, and the high sensitivity troponin I level was 143 ng/L. The blood results also revealed a white blood cell (WBC) count of 7.3 10*9/l, with lymphocyte count of 0.9 10*9/l and normal neutrophil count. On the third day after his amputation, he developed signs of chest infection including increased respiratory rate to 29 per min and mild drop in oxygen saturation to 95%. Clinical examination revealed bibasal crepitations, and chest radiography demonstrated fluid overload and basal atelectasis. Repeated bloods displayed a WBC count of 6.7, with lymphocyte count of 0.6 and normal neutrophil count. Oxygen therapy was initiated along with piperacillin/tazobactam in accordance with our local infectious disease guidelines and intravenous diuretic (Furosemide). His condition started improving — respiratory rate returned to 18 per min, and his oxygen saturation increased to 98% on room air after 24 hr of treatment.

On day five, he unexpectedly developed high temperature of 38.5 degrees of Celsius and new dry cough. SARS-CoV-2 was suspected and later confirmed on throat swabs. Repeated blood results revealed a WBC count of 5.2 10*9/l with a lymphocyte count of 0.3 10*9/l. In view of his

medical background, a multidisciplinary team decision (including his daughter and geriatrician) was made that ceiling of care would be limited to level I ward–based care. His condition started deteriorating rapidly and he, sadly, passed away on day six after his amputation because of acute respiratory distress syndrome (ARDS), which was diagnosed in accordance with Berlin criteria, inflicted with SARS-CoV-2 infection.[9]

DISCUSSION

The management of ruptured PAA can be challenging and carries a high risk of morbidity and mortality. A primary amputation has been described as the last resort in cases where arterial reconstructive surgery is not possible or considered high risk and was reported in three of 48 cases (6.25%) in a recent systematic review of the literature.[10]

In the presented case, the endovascular approach was not appropriate owing to occluded runoff vessels and unsuitable anatomy. The only remaining options for invasive intervention were open repair with a bypass or a major amputation. Owing to his comorbidities, he was at high risk of mortality from prolonged surgery, so (as he was keen on intervention) the decision was made to proceed with the above-knee amputation.

Emerging evidence shows that advanced age and underlying comorbidities, such as cardiovascular disease, diabetes mellitus, cancer, and COPD, are independent risk factors of adverse outcomes in SARS-CoV-2 infections.[11,12] The three primary symptoms of COVID-19 are fever, cough, and shortness of breath. Symptoms may appear within a varying timeframe after exposure (from 2 days to 14 days). The most common COVID-19–related complications encompass ARDS (29%), viremia (15%), acute cardiac injury determined by elevated high-sensitivity troponin (12%), and secondary infection (10%).[11] Moreover, emerging evidence suggests a correlation between cardiac events, such as myocardial infarction, myocarditis, and heart failure, and infection with SARS-CoV-2, resulting in adverse outcomes.[13]

We suspect that the patient might have contracted the viral infection before his admission, and the cardiac event complicating his recovery could be associated with SARS-CoV-2 infection. It remains unknown whether the virus infection could have led to severe inflammatory response, resulting in aneurysm rupture. The impact of SARS-CoV-2 infection on the postoperative course of patients undergoing vascular procedures remains largely unknown. However, incoming evidence shows that patients undergoing surgery during SARS-CoV-2 incubation period develop respiratory complications in postoperative course in more rapid pace (3.5 days) as compared with the group without a surgery (8 days).[14] Blood results of the patient showed rapidly decreasing number of lymphocyte, which has been linked to adverse outcomes and poor prognosis in patients with confirmed COVID19 infection.[15]

This is the first report of a rare emergency clinical condition that was complicated by SARS-CoV-2 infection resulting in a dismal surgical outcome. This case highlights that patients with vascular disease with preexisting comorbidities are more likely to sustain increased rate of adverse events in case of SARS-CoV-2 infection (despite successful surgical outcome). The role of cardiovascular comorbidity in patients with SARS-CoV-2 infection undergoing surgery requires further investigation.

None.

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