Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Follow-up after acute thrombotic events following COVID-19 infection

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ABSTRACT

Objective: COVID-19 infection results in a hypercoagulable state predisposing patients to thrombotic events. We report the 3- and 6-month follow-up of 27 patients who experienced acute arterial thrombotic events in the setting of COVID-19 infection.

Methods: Data were prospectively collected and maintained for all vascular surgery consultations in the Mount Sinai Health System from patients who presented between March 16 and May 5, 2020.

Results: Twenty-seven patients experienced arterial thrombotic events. The average length of stay was 13.3 ± 15.4 days. Fourteen patients were treated with open surgical intervention, six were treated with endovascular intervention, and seven were treated with anticoagulation only. At 3-month follow-up, 11 patients (40.7%) were deceased. Nine patients who expired did so during the initial hospital stay. The 3-month cumulative primary patency rate for all interventions was 72.2%, and the 3-month primary patency rates for open surgical and endovascular interventions were 66.7 and 83.3, respectively. There were 9 (33.3%) readmissions within 3 months. Six-month follow-up was available in 25 (92.6%) patients. At 6-month follow-up, 12 (48.0%) patients were deceased, and the cumulative primary patency rate was 61.9%. The 6-month primary patency rates of open surgical and endovascular interventions were 66.7% and 55.6%, respectively. The limb-salvage rate at both 3 and 6 months was 89.2%.

Conclusions: Patients with COVID-19 infections who experienced thrombotic events saw high complication and mortality rates with relatively low patency rates. (J Vasc Surg 2022;75:408-15.)

Keywords: COVID-19; Limb ischemia; Thrombosis; Amputation; Patency

COVID-19 has a wide range of recognized presentations from asymptomatic carriers to upper respiratory symptoms, and in severe cases, acute respiratory distress syndrome, multiorgan failure, and death. However, there is increasing evidence documenting the COVID-19-associated thrombotic complications in the central, cerebral, and peripheral circulation.[1] These events are frequently seen in patients without conventional cardiovascular risk factors.

Immediate outcomes after COVID-19-associated acute thrombotic events appear to be poor, with reported in-hospital mortality rates ranging from 33% to 46% and early rates of limb loss ranging from 6.7% to 25%.[2-5] However, there are very limited data regarding follow-up of patients after medical treatment or surgical or endovascular intervention. In this study, we report 3-month and 6-month follow-up of patients who were treated for acute thrombotic arterial events in the setting of COVID-19 infection.

METHODS

Data source and selection of patients. Patients with acute vascular complications associated with COVID-19 infection were enrolled into the study protocol. Data were prospectively collected and maintained for all vascular surgery consultations in the Mount Sinai Health System. Data were collected from patients who presented between March 16, 2020, and May 5, 2020. COVID-19 infection was confirmed in all patients by polymerase chain reaction testing. Patients who tested negative for COVID-19 despite respiratory symptoms were excluded.

The primary outcome was primary patency of the vascular intervention. Secondary outcomes included mortality, hospital length of stay, and limb salvage. General anesthesia was used predominantly for open surgical intervention, and local or regional anesthesia was used predominantly for endovascular intervention. Patency was assessed using duplex ultrasound,

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computed tomography, angiogram, Doppler ultrasound, and pulse examination. Clinical indicators of patency including freedom from tissue loss or recurrent rest pain were also documented. Mild COVID-19 infection was defined as a hospitalized patient with SpO_2 greater than 94% on room air and no radiographic evidence of pneumonia. Moderate COVID-19 infection was defined as hospitalized patients with hypoxia (SpO_2 less than or equal to 94% requiring supplemental oxygen) or radiographic evidence of pneumonia. Severe COVID-19 infection was defined as patient requiring more than nasal cannula to maintain oxygen saturation. These definitions are adopted from established classifications.[6,7]

Statistical analysis. To assess for significance in patient outcomes, univariate analysis was performed using Pearson χ^2 and Fisher exact tests for categorical variables and the Student *t*-test for continuous variables. Kaplan-Meier life tables were used to assess primary patency rates and limb-salvage rates. Patients whose initial intervention was primary amputation without attempted prior revascularization were not included in limb salvage rates. Anatomic data were confirmed in all patients incorporated into the Kaplan-Meier life tables. Log-rank analysis was used to compare the primary patency rates of endovascular and open surgical interventions. A *P* value of ≤.05 was considered to be statistically significant. All analyses were performed with SAS 9.4 (Cary, NC). Informed consent was obtained with consent to be treated and all patients were de-identified. This study was conducted under the institutional review board-approved protocol.

ARTICLE HIGHLIGHTS

- **Type of Research:** Single-center, prospective analysis.
- **Key Findings**: Twenty-seven patients with acute thrombotic events associated with COVID-19 were treated with vascular intervention or conservatively with anticoagulation. The study showed a 72.2% primary patency rate, a 40.7% mortality rate, an 89.2% limb salvage rate at 3 months, and a 61.9% primary patency rate, a 48.0% mortality rate, an 89.2% limb salvage rate at 6 months.
- **Take Home Message:** Patients with COVID-19 infections who experienced thrombotic events saw high complication and mortality rates with relatively low patency rates.

RESULTS

Demographics and comorbidities

Twenty-seven patients experienced arterial thrombotic events that required vascular management (Fig 1). The average age was 65.0 ± 13.8 years. Ten (37.0%) patients were female. Ten (37.0%) patients were Caucasian, five (18.5%) were African American, four (14.8%) were Hispanic, three (11.1%) were Asian, and for five (18.5%) ethnicity was unknown. Baseline antiplatelet and anticoagulant medications included four (14.8%) patients on enoxaparin, five (18.5%) on apixaban, seven (25.9%) on aspirin, and four (14.8%) on clopidogrel (Supplementary Table I, online only).

A total of 44.4% of patients had diabetes, 37.0% had peripheral vascular disease (PVD), 22.2% had coronary artery disease, 14.8% had chronic obstructive pulmonary disease, 11.1% had congestive heart failure, and 11.1% had chronic kidney disease. A total of 25.9% of patients were obese, and 44.4% were current or former smokers (Supplementary Table II, online only).

Admission indications

The indication for admission was complications of COVID-19 infection in 7 (25.9%) patients, acute limb ischemia (ALI) in 12 (44.4%) patients, acute-on-chronic limb ischemia in 7 (25.9%) patients, and hypertension complicated by COVID-19 in 1 patient (3.7%; Supplementary Table III, online only).

Initial interventions and treatment

Twenty-three (85.2%) arterial thrombotic events occurred in the lower extremity, and 4 (14.8%) occurred in the upper extremity. Fourteen (51.9%) patients were treated with open surgical intervention. Open surgical revascularization procedures included two bypass grafts and six open thrombectomies. Two patients were treated with primary major lower extremity amputation. Four patients were treated with restoration of arterial inflow with open thrombectomy and simultaneous primary major lower extremity amputation. Six (22.2%) patients were treated with endovascular intervention, including two percutaneous pharmomechanical thrombectomies, two angioplasties with catheter-directed thrombolysis, one angioplasty and stenting with catheter-directed thrombolysis, and one angioplasty and stenting with minor amputation. Seven (25.9%) patients with acute arterial thrombosis were treated conservatively with anticoagulation only, one of whom underwent concomitant toe amputation.

Of patients who underwent vascular intervention, 14 received general anesthesia. Seven patients received monitored anesthesia care with local anesthetic. General anesthesia was used in 100% of open surgical procedures, and monitored anesthesia care with local anesthetic was used in 100% of endovascular procedures ($P < .01$; Table I).

The average hospital length of stay was 13.3 ± 15.4 days. There was no significant difference in length of stay

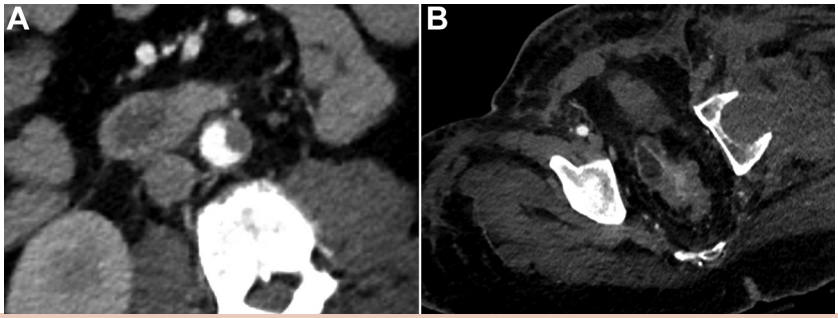


Fig 1. A, Computed tomography angiography showing eccentric thrombus in the lower abdominal aorta in the setting of COVID-19 infection **(B)** with an associated acute thrombotic event in the left common femoral artery, causing acute limb ischemia (ALI).

Table I. Primary operative procedure and anesthesia types

Initial intervention type (n = 27)	No. (%)
Open surgical procedures	14 (51.9)
Major amputation	2 (7.4)
Restoration of arterial inflow with simultaneous primary major amputation	4 (14.8)
Open thrombectomy	6 (22.2)
Bypass graft	2 (7.4)
Endovascular procedures	6 (22.2)
Percutaneous thrombectomy	2 (7.4)
Angioplasty with catheter-directed thrombolysis	2 (7.4)
Angioplasty and stenting with catheter-directed thrombolysis	1 (3.7)
Angioplasty and stenting with minor amputation	1 (3.7)
Anticoagulation only	7 (25.9)
Anesthesia type	
General	14 (51.9)
MAC with local anesthetic	7 (25.9)

MAC, monitored anesthesia care.

between the patients treated with open surgical and endovascular interventions ($P = .79$).

A total of 19 of 20 patients who received open surgical intervention or endovascular intervention were anticoagulated postoperatively. Five patients were treated with subcutaneous anticoagulation alone, two were treated with subcutaneous anticoagulation and antiplatelet therapy, seven were treated with oral anticoagulation alone, and five with oral anticoagulation and antiplatelet therapy. The one patient who was not anticoagulated was treated with dual antiplatelet therapy.

Outcomes and follow-up

Three-month follow-up. Three-month follow-up was available in all 27 (100%) patients. On 3-month follow-up, 11 (40.7%) patients were deceased. Nine (81.8%) of the patients who expired did so during their initial hospital stay. Causes of death included one (9.1%) cardiac arrest, seven (63.6%) cases of pneumonia, and three (27.3%) multisystem organ failures. Causes of death of the patients who survived initial hospitalization but died within 3 months of their index intervention included one pneumonia and one multisystem organ failure. Four of the seven patients treated conservatively were deceased at 3 months. Nine (33.3%) patients required readmission, eight (88.9%) of which were unplanned (Table II). Indications for readmission included hypoxia in two patients, critical limb ischemia in two patients, cerebrovascular accident in one patient, cellulitis in one patient, coronary artery disease in one patient, wound infection in one patient, and

Table II. Three- and six-month outcomes

Mortality	3-month outcomes (n = 27), no. (%)	6-month outcomes (n = 25), no. (%)
Total mortality	11 (40.7)	12 (48.0)
Cardiac arrest	1 (9.1)	1 (8.3)
Pneumonia	7 (63.6)	7 (58.3)
Multisystem organ failure	3 (27.3)	4 (33.3)
Postoperative complications		
Total readmissions	9 (33.3)	9 (36.0)
Unplanned readmissions	8 (29.6)	8 (32.0)
Deep vein thrombosis	2 (7.4)	2 (8.0)
Hemorrhage	5 (18.5)	6 (24.0)
Ischemic neuropathy	2 (7.4)	2 (8.0)
Wound infection	9 (33.3)	9 (36.0)
Myocardial infarction	2 (7.4)	2 (8.0)
Major amputation	3 (11.1)	3 (12.0)
Acute kidney injury	4 (14.8)	4 (16.0)
Stroke	2 (7.4)	2 (8.0)
Pneumonia	3 (11.1)	3 (12.0)
Reintubation	2 (7.4)	2 (8.0)

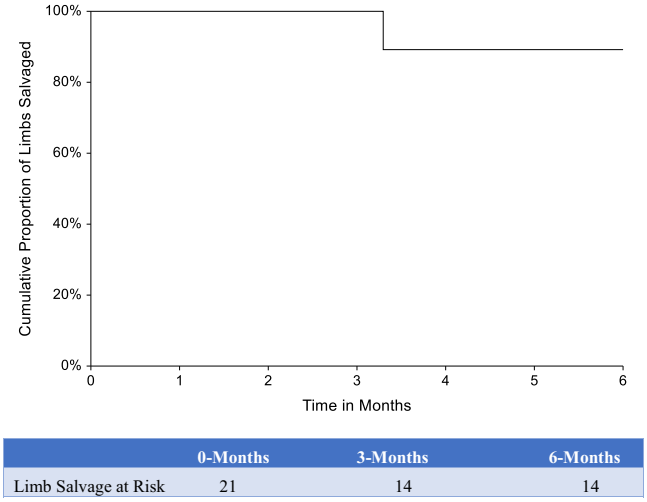


Fig 2. Kaplan-Meier life table analysis showing limb salvage rates of 89.2% ± 7.2% at 3 and 6 months, and number of patients at risk of limb loss at 0, 3, and 6 months.

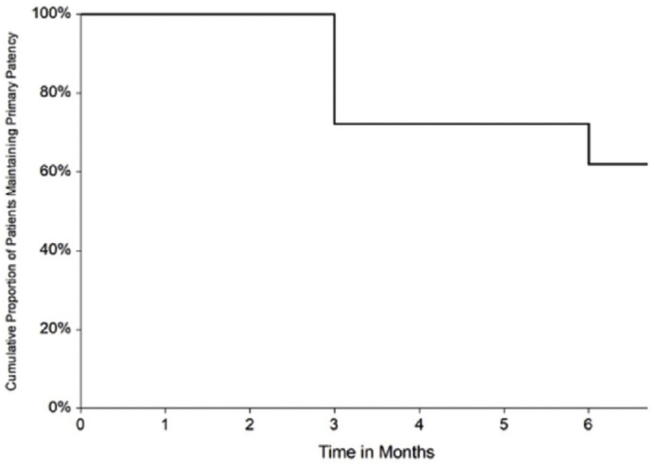
amputation stump infarction in one patient. The 3-month limb salvage rate was 89.2% ± 7.2% (Fig 2).

The Kaplan-Meier life table analysis demonstrated the overall 3-month primary patency rate to be 72.2% ± 10.6% (Fig 3). The 3-month patency rates for open surgical and endovascular interventions were 66.7% ± 13.6% and 83.3% ± 15.2%, respectively (Fig 4). At 3 months in the open surgical revascularization group, one of two bypass grafts and three of six open thrombectomies remained patent. In the endovascular treatment group at 3 months, two of three percutaneous thrombectomies and one of one angioplasty with catheter-directed thrombolysis maintained patency. Three of three patients treated conservatively experienced no progression of their symptoms.

Nineteen (70.4%) patients experienced one or more postoperative complications within 3 months of their index procedure. These included nine (33.3%) patients with wound infections, two (7.4%) with deep vein thrombosis, four (14.8%) with acute kidney injuries, three (11.1%) major amputations, two (7.4%) myocardial infarctions (MIs), two (7.4%) strokes, three (11.1%) cases of pneumonia, two (7.4%) reintubations, and one (3.7%) arterial occlusion. Five (18.5%) patients experienced hemorrhagic complications, which included one graft dehiscence and hemorrhage due to graft infection, one bleed from the tracheostomy site, and three hematomas. Two (7.4%) patients experienced ischemic neuropathy (Table II).

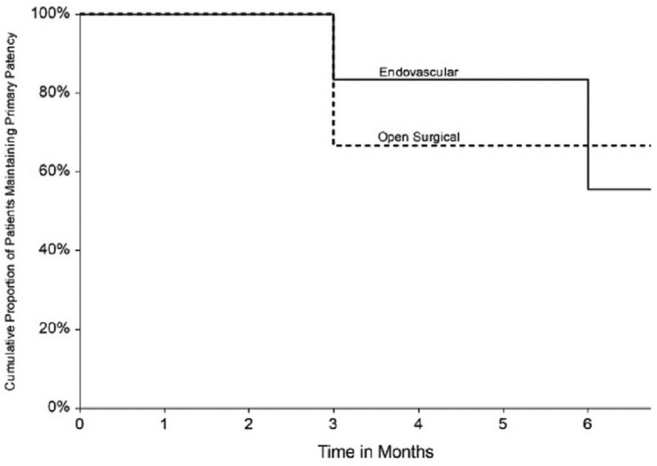
Six-month follow-up. Six-month follow-up was available in 25 of 27 patients (92.6%). Twelve (48.0%) patients were deceased, all of whom were arterial patients. The patient who expired after 3 months was initially discharged from the hospital and later died of multisystem organ failure. There were nine total major lower extremity amputations in seven (28.0%) patients at 6 months, six of which were performed as the initial treatment. The Kaplan-Meier analysis demonstrated the 6-month limb salvage rate to be 89.2% ± 7.2% (Fig 2). No patients required major lower extremity amputation between 3 and 6 months.

The Kaplan-Meier life table analysis demonstrated the overall 6-month primary patency rate to be 61.9% ± 13.2% (Fig 3). The 6-month patency rates for open surgical and endovascular interventions were 66.7% ± 13.6% and 55.6% ± 24.9%, respectively. The Kaplan-Meier life table



	0-Months	3-Months	6-Months
Primary Patency at Risk	18	7	5

Fig 3. Kaplan-Meier life table analysis showing 3- and 6-month primary patency rates of vascular interventions at 72.2% ± 10.6% and 61.9% ± 13.2%, respectively, for patients with acute thrombotic events associated with COVID-19 infection, with number of patients at risk of loss of primary patency at 0, 3, and 6 months.



Number at Risk	0-Months	3-Months	6-Months
Endovascular Intervention	6	3	1
Open Surgical Intervention	12	4	4
Total	18	7	5

Fig 4. Kaplan-Meier life table analysis showing 3- and 6-month primary patency rates of endovascular interventions at 83.3% ± 15.2% and 55.6% ± 24.9%, respectively, and 3- and 6-month primary patency rates of open surgical interventions at 66.7% ± 13.6% ($P = .93$). The *solid lines* indicate endovascular intervention, and the *dashed lines* indicate open surgical intervention.

analysis showed no significant difference in primary patency between patients treated with open surgical and endovascular interventions ($P = .93$; Fig 4). At 6 months in the open surgical revascularization group, one of two bypass grafts and three of six open thrombectomies remained patent. There were no open surgical revascularizations that lost patency between 3 and 6 months. In the endovascular treatment group at 6 months, one of two percutaneous thrombectomies maintained patency. One endovascular intervention lost patency between 3 and 6 months. Two of two patients treated conservatively experienced no progression of their symptoms.

In between 3- and 6-month follow-up, there was one additional hemorrhagic complication that was a gastrointestinal bleed that occurred at 112 days postoperatively in a patient who was anticoagulated with apixaban. No other complications were seen between 3- and 6-month follow-up (Table II).

The average time from intervention to diagnosis of complication was 29.7 ± 22.2 days for wound infections, 48.7 ± 42.0 days for hemorrhage, 59.0 ± 21.2 days for ischemic neuropathy, 7.5 ± 6.5 days for deep vein thrombosis, 2.8 ± 2.2 days for acute kidney injury, 16.0 ± 23.4 days for major amputations, 8.5 ± 10.6 days for MI, 15.5 ± 20.5 days for cerebrovascular accident, and 39.0 ± 44.2 days for pneumonia. The one arterial occlusion occurred at 12 days.

DISCUSSION

COVID-19 continues to infect thousands of people worldwide each day with an increasing death count months after its initial discovery and presentation.[8] There are increasing reports of thrombotic complications after COVID-19. Arterial thromboembolism has been observed in intensive care unit patients at a rate of 3.7%.[9] Bellosta et al[3] published a study evaluating a series of 20 patients with ALI and COVID-19 in Lombardy, Italy. Similarly, ALI has been described in case series from New York City[10,11] and Scotland[12] in dozens of patients with COVID-19. There were 6095 patients at the Mount Sinai Hospital with laboratory-confirmed COVID-19 in March and April.[13] We found that 26 patients experienced an acute arterial thrombotic event during this time period, giving a rough incidence rate of 0.4% of patients with COVID-19. Thus, it is important that we improve our understanding of the thrombotic sequelae of COVID-19 on the arterial and venous circulation to optimize management of thrombotic events. Although multiple studies report immediate outcomes after thrombotic events, there are limited follow-up data. To the authors' knowledge, this is the first study to report 3-month or 6-month outcomes after acute thrombotic events from COVID-19.

In New York City, the number of patients admitted with COVID-19 rapidly increased in March 2020 and then quickly declined, and there were very few people hospitalized with COVID-19 after May 2020. Thus, there were even fewer patients who experienced acute arterial thrombotic events in the following months. As the number of patients with COVID-19 has increased throughout the country, we expect the incidence of associated arterial thrombotic events to likewise increase.

Hypertension was the most frequent patient comorbidity in this study. Few patients had clinically evident underlying PVD. This suggests that PVD was not the main driver of acute thrombotic events. It was not possible to definitively establish whether the etiology of these events was in situ thrombosis or embolus from a remote source in the majority of patients. Furthermore, the majority of patients with ALI did not have severe COVID-19 infection, suggesting that COVID-19 disease severity may not necessarily correlate with risk of acute arterial thrombotic events. Thus, these acute arterial events may develop via a separate mechanism. However, this finding may be biased by having a larger number of patients hospitalized with moderate COVID-19 infection than with severe infection.

The majority of patients underwent a procedure that was most commonly open surgical intervention. The intervention rate in patients with acute thrombotic events in our series is 74%. In thrombotic events seen in patients with COVID-19, the intervention rates have a wide range in the literature. In Garg et al[10] series of patients, the intervention rate was 50%. In a study of seven patients by Kashi et al[14] in France, only two patients underwent surgical intervention. In our study, the patients who were treated with heparin alone and did not receive any intervention had critical COVID-19 illness and severity of presentation that precluded surgical revascularization. The primary amputation rate in this study was 22.2% for major amputations and 7.4% for minor amputations. This is higher than other reported rates in the literature. In Etkin et al[5] series of 49 patients, the primary amputation rate was 10%.

In our study, there was a high mortality rate of 40.7% at 3 months and 48.0% at 6 months, which appear to be greater than mortality rates of non-COVID patients with ALI. In their study of 1000 consecutive revascularized limbs, Taylor et al[15] reported an overall 6-month mortality rate of 14%. Other studies have shown 6-month mortality rates of 12.3% and 16%.[16,17]

The causes of mortality in our study included cardiac arrest, pneumonia, and multisystem organ failure. A total of 75% of deaths occurred during the initial hospitalization and 25% occurred after discharge. Thus, the highest risk for mortality is during the initial hospitalization. A recent study published by the COVIDSurg collaborative showed a 30-day mortality rate of 23.8% in 1128 COVID-19 positive patients who underwent general surgery.[18] Bellosta et al saw a mortality rate of 40% during the inpatient admission.[3] The causes of death were multisystem organ failure, MI, and acute respiratory distress syndrome. Our patients also had a high rate of postoperative complications and readmissions. The postoperative complications included wound infections and hemorrhagic complications, major amputations, strokes, MIs, and pneumonia. The large number of patients experiencing postoperative thrombotic complications suggests that the hypercoagulable state associated with COVID-19 infection may persist beyond the initial thrombotic event and intervention in these patients. In other studies, pulmonary complications were frequent at 51.2% and mortality was increased in patients older than 70 years of age and in patients who underwent emergency surgery.[18]

Our study also found that two patients developed postoperative ischemic neuropathy. In one patient, intervention was delayed by 14 days because of the COVID-19 pandemic, likely precipitating this complication. The other patient experienced 7 days of lower extremity numbness and pain before presenting to the hospital with acute limb ischemia. This highlights the risks of delayed presentation and intervention that patients may face in the setting of the COVID-19 pandemic.

Early in the pandemic experience, endovascular approaches for the treatment of acute thrombotic events appeared to have lower efficacy anecdotally, and therefore we preferred to use an open surgical revascularization approach. This highlights the importance of this study in providing more objective data to determine the optimal surgical management of patients with acute thrombotic events associated with COVID-19.

This study showed an overall 72.2% 3-month primary patency rate, a 61.9% 6-month primary patency rate, and major amputations in 28.0% of patients at 6 months. The majority of amputations occurred during the initial hospitalization. Previous studies on non-COVID patients undergoing intervention for ALI have shown primary patency rates of 79%-88% at 6 months[19-21] and 69.1% at 1 year.[22] There are a few potential reasons for why the patency rates are low and primary amputation rates are high in this COVID-19 patient population. First, there is increasing evidence of a procoagulant state induced by viral infection[23] and inflammation.[24] This may be due to underlying endotheliitis and subsequent injury.[25] Thus, although the surgery may have a high technical success rate, patients with acute COVID-19 infections remain in a prothrombotic state that increases their chances of recurrent thrombosis. In addition, it is unclear whether severity of endothelial injury is correlated with COVID-19 severity alone. In our study, COVID-19 severity did not necessarily correlate with an acute arterial event. In addition, patients with COVID-19 and an acute thrombotic event may have a high thrombus burden from the prothrombotic state resulting in more profound ischemia.

This study showed a 6-month limb salvage rate of 89.2%, which is similar to that of non-COVID-19 patients with ALI, as studies have shown 6-month limb salvage rates of 83%-90%.[15-17] No patients with nonocclusive thrombosis who did not have clinically significant ischemia were included in our study. It appears that lower extremity revascularization is effective at preventing limb loss in patients with COVID-19 if the patient survives the initial illness without major amputation.

In addition, choice of anticoagulation postoperatively is important. Studies have shown that patients will still have thrombotic events despite prophylactic anticoagulation.[26] In fact, the failure rate of prophylactic doses of low-molecular-weight heparin has been shown to be 20% in patients with COVID-19, which is significantly higher than the 2.7% failure rate shown in randomized clinical trials in critically ill, non-COVID patients.[2] Current guidelines state that all hospitalized patients with COVID-19 should be treated with prophylactic anticoagulation and that anticoagulant and antiplatelet therapy should not be used to prevent arterial thromboses outside of the standard of care for non-COVID patients. Interestingly, in our series, several patients developed thrombotic events on anticoagulation. A total of 18.5% of the patients in our series were on apixaban before admission, and 14.8% were on prophylactic dose low-molecular-weight heparin. Therefore, the lower patency rates are likely related to an insufficient understanding of the mechanism of thrombosis in these patients and also possibly to the severity of endothelial injury.

We present the largest series of follow-up on patients with thrombotic events in the setting of COVID-19 to date. However, our study does have several limitations. Statistical analysis was influenced by having a larger number of patients hospitalized with moderate COVID-19 than severe COVID-19. Postprocedural follow-up imaging was not available in a minority of patients. Furthermore, the type of revascularization performed was influenced by patient presentation. Finally, this study included only patients for whom vascular surgery consult was performed.

CONCLUSIONS

Patients with acute COVID-19 infections who experienced acute arterial thrombotic events saw overall poor outcomes at 3- and 6-month follow-up. In particular, these patients saw a relatively lower patency rate, high complication rate, high mortality rate, and limb loss. The major risk of adverse events appears to be during the initial hospitalization, and patients who survive the hospitalization without a major amputation may have a prognosis similar to that reported for patients with ALI not associated with COVID-19 infection.

AUTHOR CONTRIBUTIONS

Conception and design: CF, AR, PF
Analysis and interpretation: CF, AR, NI, PK, SF, WT, AV, RT, MM, PF
Data collection: CF, SH
Writing the article: CF, NI
Critical revision of the article: CF, AR, NI, SH, PK, SF, WT, AV, RT, MM, PF
Final approval of the article: CF, AR, NI, SH, PK, SF, WT, AV, RT, MM, PF
Statistical analysis: NI
Obtained funding: Not applicable
Overall responsibility: CF
CF and AR contributed equally to this work.

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Supplementary Table I (online only). Patient demographics and baseline anticoagulant and antiplatelet medications

Demographics	No. (%)
Total number of patients	27 (100)
Age	65.0 years
Female	10 (37.0)
Ethnicity	
Caucasian	10 (37.0)
Hispanic	4 (14.8)
African American	5 (18.5)
Asian	3 (11.1)
Unknown/other	5 (18.5)
Preoperative medications	
Enoxaparin	4 (14.8)
Apixaban	5 (18.5)
Rivaroxaban	0 (0)
Aspirin	7 (25.9)
Clopidogrel	4 (14.8)

Supplementary Table II (online only). Patient medical comorbidities

Medical comorbidities (n = 27)	No. (%)
Hypertension	19 (70.4)
Hyperlipidemia	11 (40.7)
Peripheral vascular disease	10 (37.0)
Diabetes mellitus	12 (44.4)
Chronic kidney disease	3 (11.1)
ESRD on HD	1 (3.7)
Coronary artery disease	6 (22.2)
Congestive heart failure	3 (11.1)
Prior CVA	4 (14.8)
Obesity	7 (25.9)
COPD	4 (14.8)
Smoking status	
Never smoker	10 (37.0)
Former smoker	9 (33.3)
Current smoker	3 (11.1)
Unknown smoking status	5 (18.5)
COVID-19 severity on admission	
Mild	11 (40.7)
Moderate	14 (51.9)
Severe	2 (7.4)

COPD, chronic obstructive pulmonary disease; *CVA*, cerebrovascular accident; *ESRD*, end-stage renal disease; *HD*, hemodialysis.

Supplemental Table III (online only). Admission indications

Admission indication (n = 27)	No. (%)
COVID-19	7 (25.9)
Acute limb ischemia	12 (44.4)
Acute on chronic limb ischemia	7 (25.9)
Hypertension	1 (3.7)