Prevalence of Deep Venous Thrombosis in Abdominoplasty Patients after COVID-19 Convalescence: An Alarming Flag

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Background: The incidence of thrombotic manifestations during aesthetic procedures may be overwhelming, as it may endanger patients’ lives. Lipoadminoplasty is one of the precarious aesthetic treatments with risk for thrombosis. COVID-19 convalescent patients may have an abnormally high rate of thrombotic events, which should be studied further. Patients with a history of COVID-19 infection who undergo the aesthetic procedure may have a greater risk of thrombosis than non-COVID-19 patients who undergo lipoadminoplasty.

Methods: Thirty-seven patients who underwent lipoadminoplasty were followed retrospectively for the occurrence of thrombotic events postoperatively and their relationship to previous COVID-19 infection. The study design comprised an examination of their medical records for prior COVID-19 infection, a history of thrombotic events before, during, or following COVID-19 infection, and D-dimer levels during and after COVID-19 infection. Thrombotic signs were studied in COVID-19 convalescent and non-COVID-19 patients following lipoadminoplasty. The universal prophylactic measures for anticoagulation were followed.

Results: Four patients out of 37 (10.18%) had thrombotic manifestations, with a high incidence in the COVID-19 convalescent group. The occurrence rate in COVID-19 patients was 30.7%, much higher than the global rate (0.2%). The presence of D-dimers was discovered to be abundant.

Conclusion: Additional precautions should be taken to closely monitor patients with a prior history of COVID-19 infection who seek aesthetic surgery, particularly riskier procedures such as lipoadminoplasty. (Plast Reconstr Surg Glob Open 2022;10:e4196; doi: 10.1097/GOX.0000000000004196; Published online 28 February 2022.)

INTRODUCTION

The occurrence of thrombotic events, such as deep venous thrombosis (DVT) and its devastating, life-threatening sequela, pulmonary embolism (PE), is a major healthcare issue and is a known postoperative risk for long surgical procedures. Numerous articles have discussed the need for DVT/PE prophylaxis in plastic surgery, especially liposuction and abdominoplasty treatments. In a large-scale study published in 2017 (level 2 evidence), patients developed thrombosis following all aesthetic procedures from 2001 to 2011, accounting for 0.02% of all operations. The incidence of venous thrombosis following abdominoplasty alone was 0.2% (18 of 8975 abdominoplasty cases).

The increased frequency of venous thrombosis in individuals with active COVID-19 infections is already well established. Despite reports of an increased incidence of venous thrombosis in COVID-19-infected individuals, evidence on the possibility of long-term hypercoagulability months after the infection is lacking. Elective treatments such as abdominoplasty in COVID-19-infected patients may increase the risk of venous thrombosis compared to patients undergoing the same operation with a COVID-19-negative background. Our study attempted to determine whether there is a greater risk for COVID-19 positive history after undergoing abdominoplasty or if the incidence rate is the same.

COVID-19 infection is linked to an increased risk of venous thrombosis due to endothelial dysfunction, which can occur because of direct viral invasion of endothelial cells via angiotensin-converting enzyme-2 receptors as
a result of subsequent marked inflammatory response and tissue hypoxia. COVID-19 causes a procoagulant condition by increasing factors V, VII, VIII, and X and von Willebrand factor and decreasing ADAMTS13 levels. Antiphospholipid antibodies at high levels have also been recorded, albeit their clinical significance remains unknown. Furthermore, decreased fibrinolysis has been found due to elevated plasminogen activator inhibitor 1. Moreover, platelet activation may raise the risk of VTE. This study aimed to identify an increased risk of venous thrombosis in lipoabdominoplasty patients after COVID-19 convalescence.

**PATIENTS AND METHODS**

This study was conducted between December 2020 and September 2021, following approval by the institutional board committee and appropriate patient consent. Patients undergoing lipoabdominoplasty were included if they had no prior history of venous thrombosis and no comorbidities that could enhance their risk of thrombosis. The included population may or may not have been infected with COVID-19. Patients in this study had to have a body mass index (BMI) between 25 and 35 (to avoid high risk for thrombosis). In patients with a history of COVID-19 infection, abdominoplasty was performed at least six months after COVID-19 recovery. Patients who were still taking anticoagulants were not operated on in the first place. A BMI of more than 35 was excluded to minimize an increased risk of thrombosis. The patients with BMI less than 25 were not excluded but the sample in the retrospective study did not include patients with BMI less than 25.

In a retrospective investigation of 37 patients who underwent abdominoplasty, all data were collected regarding patient demographics, smoking, and past infection with COVID-19, whether symptomatic or nonsymptomatic. Any information on their D-dimer levels during COVID-19 infection was gathered. A history of anticoagulant medicines used following COVID-19 infection was also requested. In addition, any other comorbidities that could enhance the risk of thrombosis were investigated.

Caprini thrombosis scores were assigned to all patients. At the time of procedure, all antithrombotic treatments were implemented, including intermittent pneumatic compression, warm blankets, warm fluids, and the avoidance of severe hypotension. Postoperatively, all patients received prophylactic low molecular weight heparin (Clexan R subcutaneous injection) based on their weight, starting on day one and continuing until the tenth postoperative day. Elastic stockings were worn for at least 1 week, early ambulation was encouraged, and a high fluid intake per day was recommended.

Any thrombotic symptoms (like sore calves, unilateral lower limb edema, or congested swollen veins) were evaluated immediately with a venous duplex. For patients diagnosed with any thrombotic signs during the initial venous duplex, a repeat duplex was performed at least 3 days and 1 week after the initial thrombotic diagnosis. All patients with thrombotic symptoms were referred to a vascular surgeon to treat the disorder. The data were analyzed with SPSS (statistical program for social science version 12), and the P value was computed with the Fischer exact test. The P value was calculated and associated with the variations, and it was regarded insignificant if it was greater than 0.05, significant if it was less than 0.05, and highly significant if it was less than 0.01.

**RESULTS**

The study enrolled 37 patients (32 women and five men) ranging in age from 34 to 50 years old. Each patient received a complete lipoabdominoplasty with repair of recti diastasis by rectus sheath plication. Suction was limited to three liters. Four patients were smokers who quit 2 weeks before surgery. None of the individuals had other comorbidities such as diabetes or hypertension. Thirteen patients (35.1%) were previously diagnosed with active COVID-19 infection with two or three consecutive swabs tested by PCR until negative. Only five of the 13 individuals developed mild-to-moderate COVID-19 symptoms and required one month of oral anticoagulation following COVID-19 convalescence. One of these five individuals required hospitalization during the illness activity for drug administration. D-dimer levels were evaluated and found to be elevated in these five patients at the time of infection but returned to near normal on follow-up. Caprini ratings for all patients ranged between 3 and 4 points.

Following lipoabdominoplasty surgery, four patients (10.18%) developed thrombotic symptoms ranging from DVT in the popliteal and femoral veins to high DVT in the pelvic veins. There were no cases of PE. These manifestations arose as early as the fifth day postoperatively in one patient and on days 7–14 in other patients. These four patients had a history of COVID-19 infection (the previously hospitalized patient and the other three patients who had mild to moderate symptoms for COVID-19). These findings were statistically significant, as evidenced by a P value of less than 0.01. Other data, such as D-dimer levels, smoking history, and substantial medical history in the past, were statistically inconsequential. In COVID-19 convalescent patients, the incidence of venous thrombosis following lipoabdominoplasty was 30.7%. There was no need for rehospitalization. Only bed rest and therapeutic dosages of anticoagulants (Clexan 1 mg/kg twice daily, subsequently changed to oral anticoagulants) were recommended, along with follow-up duplex scans until canalization occurred. Two of the four patients were smokers. There was no history of past coagulopathy or
comorbidities, and no other precipitating incident happened intraoperatively (Table 1; Figs. 1 and 2).

**DISCUSSION**

Elective procedures such as abdominoplasty may carry a 2% risk of thrombosis, according to a large-scale study conducted in 2017 that included 129,007 aesthetic procedures. Patients may face additional risks following their recovery from COVID-19. Research suggests that COVID-19 hospitalization does not appear to enhance the incidence of postdischarge venous thrombosis when compared to hospitalization for other acute medical illnesses. Additionally, some researchers investigated the efficacy of anticoagulants and placebo on thrombosis incidence in post-COVID-19 patients and discovered no clinically meaningful difference. The incidence of COVID-19 in our country is comparable to global levels; nevertheless, the number of convalescent patients included in this study exceeded global levels by chance. That was just coincidental, with no indication of selection bias.

This study aimed to determine whether there is an increased incidence of venous thrombosis among cosmetic patients in the COVID-19 period. Unfortunately, due to the recurrent and consecutive infection of COVID-19, the number of patients requiring aesthetic surgery has dropped precipitously. Others, however, underwent aesthetic surgery. As a result, the sample size for this study was small due to decreasing demand for aesthetic operations because of economic and health implications and fear of contracting COVID-19. This study was a retrospective case series on 37 individuals with full lipoabdominoplasty.

We discovered a dramatic rise in the risk of venous thrombosis in COVID-19 populations, from 0.2% to 10.18%, with an estimated 30.7% in COVID-19 convalescents which raises red flags for patients requiring aesthetic procedures who have already been infected with COVID-19. Although the standard of care for those patients was met, the 2005 Caprini thrombosis risk factor assessment was used to evaluate each patient’s risk factors for thrombosis, and appropriate measures to prevent thrombosis were taken. In this study, all patients received a score of 3–4, which is considered medium for the risk of postoperative venous thrombosis. Surgical patients with Caprini scores of 7–8 or greater have considerably reduced venous thrombosis risk when postoperative pharmacological prophylaxis is provided. Low molecular weight heparin or mechanical prophylaxis with intermittent pneumatic pressure is recommended in medium-risk patients. Unfortunately, intermittent pneumatic pressure was not available at home for all patients. Therefore, they were all directed to take low molecular weight heparin for 10 days postoperative, and all patients were satisfied.

The disadvantage of this study was the limited sample size, which made the statistical analysis more difficult to accomplish and may be erroneous for the entire population. Although there may not be a direct causative relationship between the lipoabdominoplasty and the post-COVID-19 hypercoagulable state, this study raises an alarm that more comprehensive future research is required. Unfortunately, selection bias is implied in our
study because there is currently no clear selection strategy for asymptomatic patients with prior COVID-19 infection (convalescence) who wish to undergo aesthetic procedures, which may be comparable to the general population. Hence, there is no way to satisfy the selection domain completely.28

CONCLUSIONS
Extra precautions and close monitoring should be used in patients with a history of COVID-19 infections who seek aesthetic surgery, particularly high-risk procedures such as lipoabdominoplasty. This risk may be introduced months after recovery from COVID-19. Before undergoing any
cosmetic operation, COVID-19 convalescent patients may require additional long-term venous thrombotic manifestation workup. This study concludes that further measures may be necessary for aesthetic patients who are properly selected. Moreover, additional research should be conducted to assess the duration of the hypercoagulable condition following COVID-19.

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