

# Intravenous Alteplase for Acute Stroke and Pulmonary Embolism in a Patient With Recent Abdominoplasty

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**Introduction:** Major surgery in the past 14 days is a relative contraindication to treatment of acute stroke with intravenous (IV) alteplase. The 2016 American Heart Association/American Stroke Association scientific statement discussing inclusion and exclusion criteria for alteplase in acute stroke allows for provider judgment citing a lack of evidence to support surgery as an absolute contraindication.

**Case Report:** A 59-year-old woman presented with acute left hemiparesis, dysarthria, and acute respiratory failure. National Institutes of Health Stroke Scale was 17. Two days prior she underwent abdominoplasty and liposuction. Computed tomography angiogram of the head demonstrated acute occlusion of right M2, and computed tomography angiogram of the chest was positive for bilateral pulmonary emboli. After urgent consultation with the plastic surgery and neurosurgery teams, the patient was treated with IV alteplase followed by cerebral mechanical thrombectomy. This was complicated by surgical-site hemorrhage in the abdomen requiring operative intervention. Abdominal hemorrhage was controlled and the patient showed remarkable neurological recovery, later being discharged with no residual neurological deficits.

**Conclusions:** Interdisciplinary collaboration can successfully inform the decision to treat acute ischemic stroke with IV alteplase in the setting of recent major surgery.

**Key Words:** acute stroke, cerebral infarct, contraindications, off-label thrombolysis, tPA

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Since its approval in 1996, intravenous (IV) recombinant tissue-type plasminogen activator (r-tPA; alteplase) has been the cornerstone of acute stroke treatment. Considering up to 50% of patients do not gain functional independence after ischemic stroke,<sup>1</sup> interventions aimed at recovery of function are crucial, and currently include endovascular therapy in addition to IV alteplase.<sup>2</sup> Although the use of IV alteplase remains the mainstay of evidence-based acute ischemic stroke therapy, it is associated with serious complications (symptomatic intracerebral hemorrhage, extracranial bleeding, orolingual angioedema), and thus eligible patients must be carefully selected. One relative contraindication to IV alteplase is major surgery within the past 14 days.<sup>3</sup> The 2016 American Heart Association/American Stroke Association update on guidelines

state, “Use of intravenous alteplase in carefully selected patients presenting with acute ischemic stroke who have undergone a major surgery in the preceding 14 days may be considered, but the potential increased risk of surgical-site hemorrhage should be weighed against the anticipated benefits of reduced stroke-related neurological deficits (Class IIb, Level of Evidence C).”<sup>4</sup> Data to guide this decision are lacking.

The questions a provider must address when making such a decision are first, what is the degree of neurological benefit the patient stands to gain from receiving alteplase, and second, how likely is a surgical-site hemorrhage to occur and what negative ramifications could this entail. A stroke neurologist will have a clear understanding of the first question, but will typically require consultation with surgical colleagues to address the second. In the case report below, this multidisciplinary approach was used to efficiently and effectively treat a postsurgical patient with ischemic stroke and pulmonary embolism using IV alteplase.

## CASE REPORT

A 59-year-old right-hand dominant woman presented to the emergency department as a stroke alert after having acute onset of left-sided weakness 52 minutes earlier. She presented from a skilled nursing facility where she had been staying following elective abdominoplasty and liposuction performed 2 days prior. Her past medical history was significant for depression, insomnia, and attention-deficit disorder. Her only stroke risk factors were oral hormone replacement therapy and recent abdominoplasty/liposuction. She was not on antithrombotic therapy. On initial evaluation she was awake and alert with left hemiparesis, dysarthria, gaze deviation, and a National Institutes of Health Stroke Scale (NIHSS) score of 17. She was diaphoretic and tachycardic, but afebrile, and using accessory muscles of respirations with an oxygen saturation of 91% on 15 L of oxygen by a nonrebreather. Physical examination was also significant for an abdominal surgical wound and 2 Jackson-Pratt (JP) drains with serosanguinous fluid. An urgent page was placed to the on-call plastic surgeon while the patient was emergently taken for computed tomography (CT).

A CT of the head without contrast showed a mild hyperdensity of the distal right middle cerebral artery, and a CT angiogram confirmed an occlusion of the right M2 segment at its origin. The vascular neurosurgeon was notified and began to prepare for endovascular intervention. Because of her clinical presentation and rapidly deteriorating respiratory status, a CT angiogram of the chest was pursued and revealed bilateral lobar and segmental acute pulmonary emboli. She was subsequently intubated and placed on a ventilator for acute hypoxic hypercarbic respiratory failure. The plastic surgeon examined the patient promptly, in addition to contacting the outside surgeon who performed the original procedure. He determined that if intra-abdominal hemorrhage were to occur after administration of IV alteplase, operative intervention could be performed. This possibility was discussed with the patient's husband who felt that neurological preservation should be the priority, and consent was obtained to proceed with IV thrombolysis followed by endovascular intervention. The

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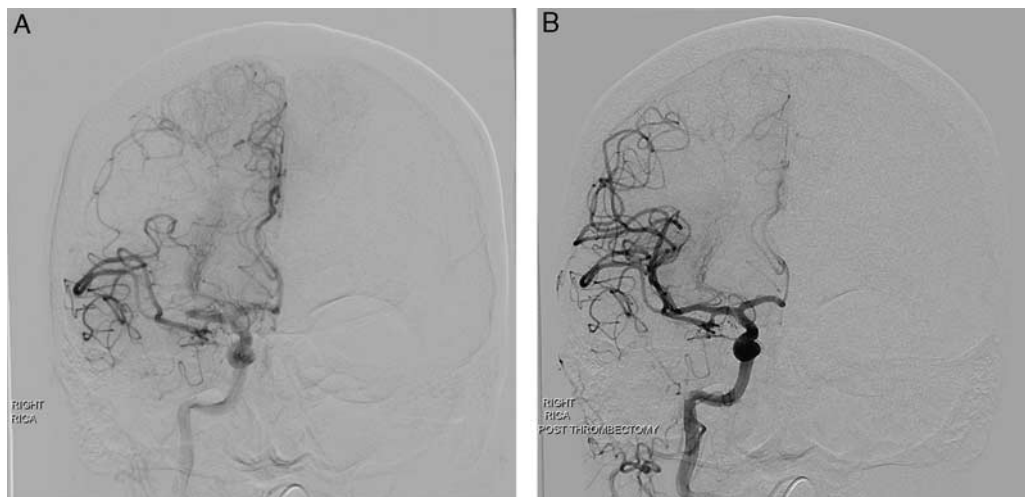
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**FIGURE 1.** A, Right internal carotid artery (RICA) angiogram with a right superior M2 division proximal occlusion. B, RICA angiogram with restoration of blood flow status—post thrombectomy.

patient received IV alteplase 52 minutes after arrival to the emergency department and 104 minutes after symptom onset. Once the alteplase infusion was initiated, the patient was taken to the angiography suite for mechanical thrombectomy of the right M2 thrombus (Fig. 1). There was successful recanalization (thrombolysis in Cerebral Infarction 3-flow restoration) 25 minutes after groin puncture, and the patient was admitted to the intensive care unit with plans for serial abdominal ultrasounds, hemoglobin, and hematocrit. Shortly after arrival in the intensive care unit, the plastic surgeon repeated an examination and found abdominal distension in addition to increased drain output, which was sanguineous. Over the course of 5 minutes, 200 mL of fresh blood was drained from the abdominal drain, with subsequent discovery of a drop in hemoglobin of 4 g/dL and progression to hemorrhagic shock. She was taken emergently to the operating room by the plastic surgery team for drainage of the abdominal hematoma. Active bleeding was controlled with electrocautery and Arista procoagulant (Bard-Davol, Providence RI). The patient received 3 units of packed red blood cells intraoperatively, and 2 additional units over the course of 12 hours. The surgical site was closely monitored throughout the remainder of her hospitalization but did not require further intervention.

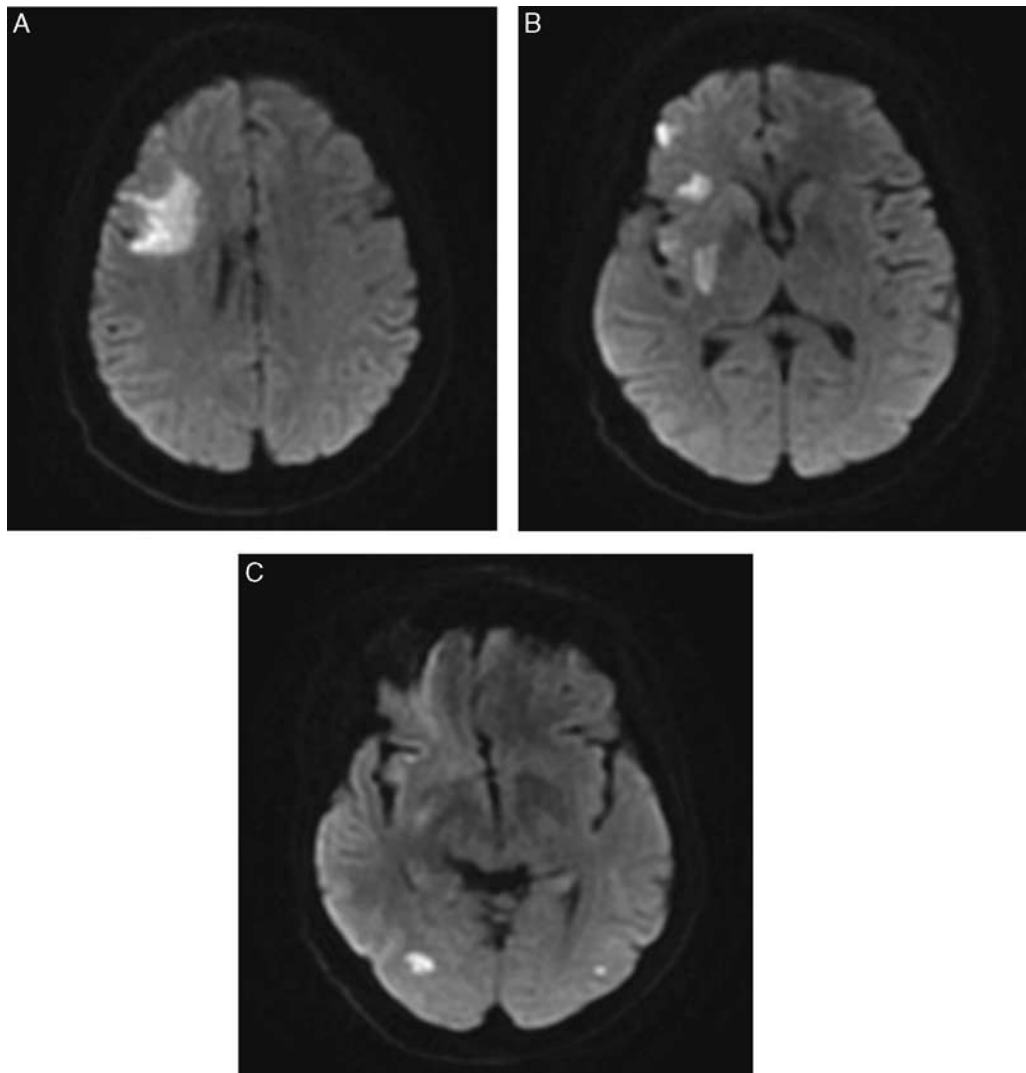
The patient showed marked respiratory improvement and was successfully extubated on hospital day 2. Initially she required 4 L of oxygen by nasal cannula, but this was quickly weaned to room air. The magnetic resonance imaging of the brain showed a primary area of acute ischemia in the right frontal lobe insula and right temporal lobe, as well as multiple tiny infarcts in the cortical hemispheres bilaterally (Fig. 2). Echocardiogram showed preserved heart function and discovered a small patent foramen ovale. Lower extremity Doppler and CT of the abdomen and pelvis were negative for deep venous thrombosis. The proposed etiology of the stroke was paradoxical embolism from deep venous thrombosis causing simultaneous cerebral and pulmonary embolism, in the setting of recent abdominoplasty and liposuction. Initially, all heparin products were withheld despite acute pulmonary embolism due to serious hemorrhage risk. A temporary inferior vena cava filter was placed on hospital day 2. Once the JP drain output was stable, subcutaneous heparin was started late on hospital day 2 along with aspirin. On hospital day 5 subcutaneous heparin was replaced with low-dose apixaban, 2.5 mg twice per day, with plans to increase to full dose 5 mg twice per day on day 15 and continue treatment for 6 months.

Neurologically the patient showed tremendous recovery with no residual deficits. By hospital day 3 the patient's NIHSS had returned to 0, and there were no focal deficits on neurological examination. She was evaluated for rehabilitative services and deemed to be safe to discharge home with home health, 6 days after admission.

## DISCUSSION

This case demonstrates how a multidisciplinary approach can lead to successful treatment of ischemic stroke with alteplase in the setting of recent major surgery. In a review of the literature, only 1 case report was identified describing alteplase use after major surgery, in this case 2 days after total hip arthroplasty, and led to a hematoma that was adequately controlled.<sup>5</sup> There are also reports of alteplase administration days after minor oral surgeries leading to controllable hemorrhage.<sup>6</sup> In studies that contained subsets of patients who had undergone surgery within the past 3 months (inguinal hernia, gynecological tumor resection, coronary bypass, femoropopliteal bypass, ankle fracture, colon resection with splenectomy, uvulectomy, pyelostomy revision), 0/8 experienced systemic hemorrhage as a complication of alteplase in one,<sup>7</sup> and 2/13 experienced controllable systemic hemorrhage following pacemaker implantation and perianal surgery in another.<sup>8,9</sup> Generally speaking, cases where surgical-site hemorrhage may require operative intervention have been excluded from receiving thrombolytic therapy.

With regard to the potential for neurological recovery, this patient was an ideal candidate for rapid aggressive treatment as she was relatively young, had little comorbidity, and was completely functional at baseline yet presented with a severe stroke syndrome. The acute treatment of pulmonary embolism was another benefit of alteplase therapy, as the intracerebral hemorrhage risk with anticoagulation would be unacceptably high, yet the patient's respiratory status had declined to the point of requiring intubation. Considering the risks of treatment with alteplase, the risk of abdominal hemorrhage was high and potential ramifications serious. The input from plastic surgery was critical to understand that such hemorrhage would most likely be treatable, and it was this point that favored proceeding with alteplase. Although this patient also underwent successful mechanical thrombectomy, we were able to administer alteplase in under an hour, while the vascular neurosurgery team was mobilized. What made the decision to give alteplase possible and ultimately successful in this case was close collaboration with plastic surgery, vascular neurosurgery, and critical care colleagues. This collaboration allowed for prompt understanding, recognition, and treatment of the anticipated complications.



**FIGURE 2.** A, Diffusion-weighted magnetic resonance imaging demonstrating punctate restriction in the right frontal lobe. B, Right frontal lobe insula and posterior right putamen. C, Right occipital lobe as well as left occipital lobe.

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