Endovascular Therapy for Acute Stroke in Patients With Cancer

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Alexander E. Merkler, MD¹, Justin R. Marcus, MD¹,
Ajay Gupta, MD², Sirish A. Kishore, MD², Dana Leifer, MD¹,
Athos Patsalides, MD³, Lisa M. DeAngelis, MD^{1,4},
and Babak B. Navi, MD^{1,4}

Abstract

Intravenous thrombolysis is the standard treatment for acute ischemic stroke (AIS). However, patients with cancer who have stroke are often precluded from therapy because of coagulopathy or recent surgery. Endovascular therapy may be a more suitable recanalization strategy for some patients with cancer and stroke, but no prior detailed reports documenting its use in this population exist. We present a case series from a tertiary care referral center of 2 patients with active systemic cancer who were successfully treated with endovascular therapy for AIS. Both patients had active lung cancer with excellent premorbid functional status and presented with severe AIS from left middle cerebral artery occlusions. Intravenous thrombolysis was deferred because of absolute contraindications. Mechanical embolectomy was performed instead and revascularization was achieved within 5 hours in both patients, resulting in dramatic neurological recoveries—*National Institutes of Health Stroke Scale* improved from 14 to 0 and from 23 to 3 from admission to discharge, respectively. In conclusion, endovascular therapy may be beneficial for select patients with cancer and AIS who are ineligible for intravenous thrombolysis. However, further studies are needed to determine the safety and efficacy of endovascular therapy in the population with cancer.

Keywords

endovascular, stroke, cancer, intervention, embolectomy

Introduction

Cancer causes a hypercoagulable state, increasing the risk of thromboembolism including acute ischemic stroke (AIS).¹ Intravenous thrombolysis appears to be safe in patients with cancer²; however, it is often contraindicated in this population because of coagulopathy or recent surgery. Endovascular therapy is an alternative treatment for AIS in patients with cancer, but there are no previous detailed reports of its use in this population. We report 2 patients with active lung cancer who were treated successfully with endovascular therapy for AIS.

Case Description

Case 1

A 70-year-old woman with stage IV lung cancer (metastases to contralateral lung), atrial fibrillation, and a premorbid modified Rankin Scale score of 0 (normal functional status) presented with 1 hour of aphasia and right hemiparesis, hemianesthesia, and hemianopsia. Her *National Institutes of Health Stroke Scale* (NIHSS) was 14. Head computed tomography (CT) revealed no

hemorrhage or early ischemic signs. Computed tomography angiogram revealed an intraluminal thrombus at the left carotid terminus extending into the proximal left middle cerebral artery (MCA) with reconstitution of the distal MCA. There was some delayed collateral flow to distal MCA branches via the ipsilateral anterior cerebral artery. Computed tomography perfusion showed a large mismatch with a small core infarction in the left putamen and a large penumbra in most of the left MCA

¹ Department of Neurology, Weill Cornell Medical College, New York, NY, USA

² Department of Diagnostic Radiology, Weill Cornell Medical College, New York, NY, USA

³ Department of Neurosurgery, Weill Cornell Medical College, New York, NY, USA

⁴ Department of Neurology, Memorial Sloan-Kettering Cancer Center, New York, NY, USA

Corresponding Author:

Babak B. Navi, Department of Neurology, 525 East 68th St, F610, New York, NY 10065, USA.

Email: ban9003@med.cornell.edu

Figure 1. Radiographic studies for case 1 (A-D). A, Baseline computed tomography perfusion (CTP) demonstrating a large ischemic penumbra (blue) in the entire left middle cerebral artery (MCA) territory and only a small core infarct within the left basal ganglia (orange). B, Cerebral angiogram showing occlusion of the left supraclinoid internal carotid artery (ICA) with some delayed collateral flow to distal MCA branches via the ipsilateral anterior cerebral artery (ACA). C, Postembolectomy cerebral angiogram demonstrating restored blood flow through the left supraclinoid ICA and proximal MCA and ACA. D, Diffusion-weighted magnetic resonance imaging (MRI) performed after embolectomy demonstrating a small acute infarction within the left lentiform nucleus in the region of core infarct identified on baseline CTP.

territory (Figure 1A). The prothrombin time (PT) was 11.9 seconds, the international normalized ratio (INR) was 1.1, and the activated partial thromboplastin time (aPTT) was 32.5 seconds. Intravenous thrombolysis was contraindicated because the patient had taken 1 mg/kg of enoxaparin for atrial fibrillation that morning. Mechanical thrombectomy with the Solitaire device (Covidien Neurovascular, Dublin, Ireland) was performed with a door-to-groin puncture time of 3 hours and 20 minutes, and successful thrombolysis in cerebral infarction (TICI) 2B revascularization (ie, partial perfusion filling $\geq 50\%$ of vascular territory) was achieved at four hours 27 minutes from symptom onset (Figure 1B and C). Brain magnetic resonance imaging (MRI) on the next day showed small infarcts in the left basal ganglia and frontal operculum (Figure 1D). After the procedure, the patient had rapid neurological recovery and was discharged on day 3 of admission on enoxaparin 1 mg/kg twice daily. On discharge,

her NIHSS was 0. At 90 days, her modified Rankin Scale score was 1 for minimal right-sided weakness (despite this symptom, she was still able to carry out all of her usual activities). At 9 months after discharge, she continues to be functionally intact and remains on enoxaparin 1 mg/kg twice daily.

Case 2

A 78-year-old woman with hypertension and diabetes was transferred to our institution after developing a complete left MCA stroke syndrome 1 day after undergoing left lung lobectomy for newly diagnosed stage IIA lung adenocarcinoma. Her modified Rankin Scale score prior to admission was 0. Upon arrival, 2 hours from onset, her NIHSS was 23 and she was in atrial fibrillation; she was not taking any antithrombotics prior to stroke. Head CT showed no hemorrhage or early ischemic signs. Computed tomography angiography showed a left MCA occlusion. The distal left MCA territory was receiving some collateral flow from cortical branches of the left anterior cerebral artery. The PT was 12.5 seconds, INR was 1.2, and the aPTT was 27.4 seconds. Intravenous thrombolysis was contraindicated because she had a major surgery recently. The patient underwent thrombectomy with the Trevo device (Stryker Neurovascular, Fremont, USA) with a door-to-groin puncture time of 57 minutes; full reperfusion (TICI 3) was achieved at 4 hours 49 minutes from onset (Figure 2A and B). The procedure was complicated by a left cervical internal carotid artery dissection but cerebral blood flow was preserved, and there was no indication for carotid stenting or further intervention. After the procedure, she was treated with intravenous heparin and aspirin. Magnetic resonance imaging performed the next day showed small infarcts in the left basal ganglia, left parietal lobe, and bilateral frontal lobes (Figure 2C). The patient was discharged on hospital day 7 on 1 mg/kg of enoxaparin twice daily and had an NIHSS of 3 for a mild right hemiparesis. Three weeks after discharge, she was transitioned from enoxaparin to warfarin. At 90 days, her modified Rankin Scale score was 3 as she required help with daily activities (mostly due to cancer-related fatigue) but could walk unassisted. She remained on warfarin at that time and had no recurrent neurological events. She died from her underlying cancer 1 year after index stroke.

Discussion

Ischemic stroke is common in patients with cancer, and approximately 10% of patients who develop an AIS have a cancer history.³ Patients with cancer who develop AIS often have advanced metastatic disease, and many have contraindications to intravenous thrombolysis such as thrombocytopenia, coagulopathy, or recent surgery.¹ Endovascular therapy is an alternative revascularization strategy that may benefit some patients with cancer who develop AIS.

Endovascular treatment has become a prominent tool for the management of AIS, resulting from proximal large artery occlusions; its use has risen 6-fold from 2004 to 2009.⁴ The

Figure 2. Radiographic studies for case 2 (A-C). A, Cerebral angiogram showing complete occlusion of the left middle cerebral artery (MCA) with some flow to distal MCA branches via anterior cerebral artery (ACA) pial collaterals. B, Selective catheterization of the left MCA demonstrating complete MCA recanalization after thrombectomy with the Trevo stent-retriever device. C, Diffusion-weighted magnetic resonance imaging (MRI) performed on postprocedure day 1, demonstrating small acute infarcts within the left basal ganglia and left parietal lobe.

efficacy of endovascular therapy for AIS, however, is uncertain, particularly for patients who can receive intravenous thrombolysis.^{4,5} In addition, patients with cancer often have significant premorbid disability and short life expectancies. These factors along with eligibility for intravenous thrombolysis, stroke severity, location of the arterial occlusion, and time from symptom onset should be considered in selecting patients for endovascular therapy. The good outcomes in our 2 patients suggest that select patients with cancer and AIS may benefit from endovascular therapy, especially if reperfusion can be achieved within 5 hours, as faster treatment times are associated with greater benefit.⁴

Thrombectomy devices have evolved considerably since the Food and Drug Administration approved the first thrombectomy device, Merci (Concentric Medical, Mountain View, USA), in 2004. The current generation devices, including Trevo and Solitaire, which were used in our 2 patients, are stent retrievers that have been shown in randomized trials to be superior than the Merci device in terms of recanalization and functional outcomes.^{6,7} However, the Trevo and Solitaire devices have not been compared to each other, so it is uncertain which one is superior. At our institution, both devices are used frequently and the choice of the device to be used is based upon the day-to-day availability of the device for the interventionalist.

Intra-arterial thrombolysis was not performed in our 2 patients. At our institution, intra-arterial thrombolysis is generally reserved for patients who fail initial revascularization attempts with mechanical thrombectomy because, in our experience, revascularization is typically quicker and more likely with thrombectomy.

In conclusion, endovascular treatment performed in very selective fashion may benefit some patients with cancer and AIS who are ineligible for intravenous thrombolysis. However, the efficacy of endovascular therapy has not been proven in clinical trials, and this report only includes 2 patients; therefore, further studies are needed to determine the utility of endovascular therapy in patients with cancer.

Declaration of Conflicting Interests

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