

CASE REPORT

Post-thrombectomy intracranial blooming artifact

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Email: jillian.prier@uscmed.sc.edu**Abstract**

Mechanical thrombectomy is a procedure used for the treatment of acute ischemic stroke in patients with large vessel occlusions. Usually with a low complication rate, we present a case with a complication post-thrombectomy not previously described in the literature noted on imaging as “blooming artifact”.

KEYWORDS

artifact, blooming, stroke, thrombectomy

1 | INTRODUCTION

Mechanical thrombectomy is a recanalization procedure used standardly for the treatment of acute ischemic stroke patients with large vessel occlusions. Complications from this procedure are uncommon. Those that have been reported are symptomatic intracranial hemorrhage within 36 hours, subarachnoid hemorrhage (SAH), air emboli, vessel dissection, major groin complications, and emboli to new vascular territories.¹⁻³

We present a case of a patient who received mechanical thrombectomy, and on post procedure imaging was found to have artifact suggestive of a retained stent retriever or catheter remnant.

2 | CASE REPORT

The patient is a 24-year-old G3P0020 at 27 weeks' gestation who presented to an outside hospital with acute onset of right-sided face, arm and leg weakness with expressive aphasia and a NIHSS of 14. She was treated with IV tPA and then transported to our institution for mechanical thrombectomy. Upon arrival, her NIHSS remained 14 with a clinical syndrome consistent with a left MCA distribution stroke.

On examination, the patient was in distress with a remarkable expressive aphasia. She was able to follow commands but had difficulties in both naming and repetition. She had significant right facial weakness and right arm more than right leg weakness. There was normal left-sided function, no neglect, no visual field defects, and no ataxia on examination.

The patient was immediately taken for repeat head Computed Tomography (CT), which did not show any acute ischemic changes or hemorrhagic conversion. A Computed Tomography Angiography (CTA) of the head and neck was then performed, which showed a complete occlusion in the left M1 segment (Figure 1). The CT perfusion demonstrated a large area of penumbra and relatively small core infarct. The RAPID software on perfusion predicted a cerebral blood flow (core) of 34.2 mL and perfusion (Tmax > 6.0 seconds) volume of 77.1 mL. The mismatch volume was estimated at 42.9 mL with a mismatch ratio of 2.3 (Figure 2).

The patient was taken for mechanical thrombectomy. Three passes were initially attempted to retrieve the thrombus using the Solitaire™ 6 × 20 stent retrieval device without success. On the fourth pass, a 3 Max catheter was then inserted in a coaxial fashion and successfully aspirated the thrombus. A 68 catheter was also utilized in this procedure; however, it was unable to advance beyond the base of the

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carotid siphon and, therefore, did not take part in the aspiration. Follow-up arteriogram demonstrated Thrombolysis in Cerebral Infarction Score (TICI) 3 with complete reperfusion (Figure 3).

A follow-up MRI the following day showed mild mass effect in the left lateral ventricle without hydrocephalus or

significant midline shift. A susceptibility artifact in the left insular cortex adjacent to the site of the thrombus was identified to be a “Blooming artifact” (Figure 4). By the time the MRI was performed and the artifact was discovered, the devices used during the procedure were already discarded. It was too late to look at the devices themselves and see if there was anything missing. The Blooming artifact was visualizable in sagittal, coronal, and axial views in all sequences, including but not limited to DWI, AVC, FLAIR, and GRE. A CT scan was also performed, on which the Blooming artifact was not visualizable.

The patient improved to a NIHSS of 10 after 24 hours. A hypercoagulable panel was performed and found Factor V Leiden negative, protein S normal, protein C low, PT/PTT test normal, dilute Russell viper venom test (DRVVT) negative for antiphospholipid inhibitor, and factor VIII high. A transesophageal echocardiogram showed a small patent foramen ovale (PFO). Given her small PFO and new stroke, an ultrasound of the legs was obtained. This did not show any evidence of deep venous thrombosis. The stroke was still deemed cryptogenic, with a possible etiology of cardio-embolic given her PFO.

We obtained an additional MRI of the brain on hospital day five to better characterize the artifact. The study again showed an identical picture of the previous MRI with a circular, blooming artifact in the left MCA distribution. We felt this was a metallic artifact from the catheter device. As

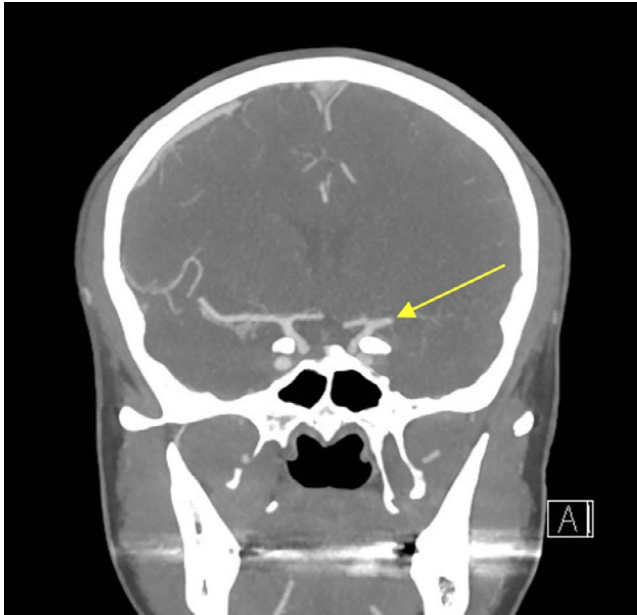


FIGURE 1 CTA showing left M1 occlusion 1/9/17

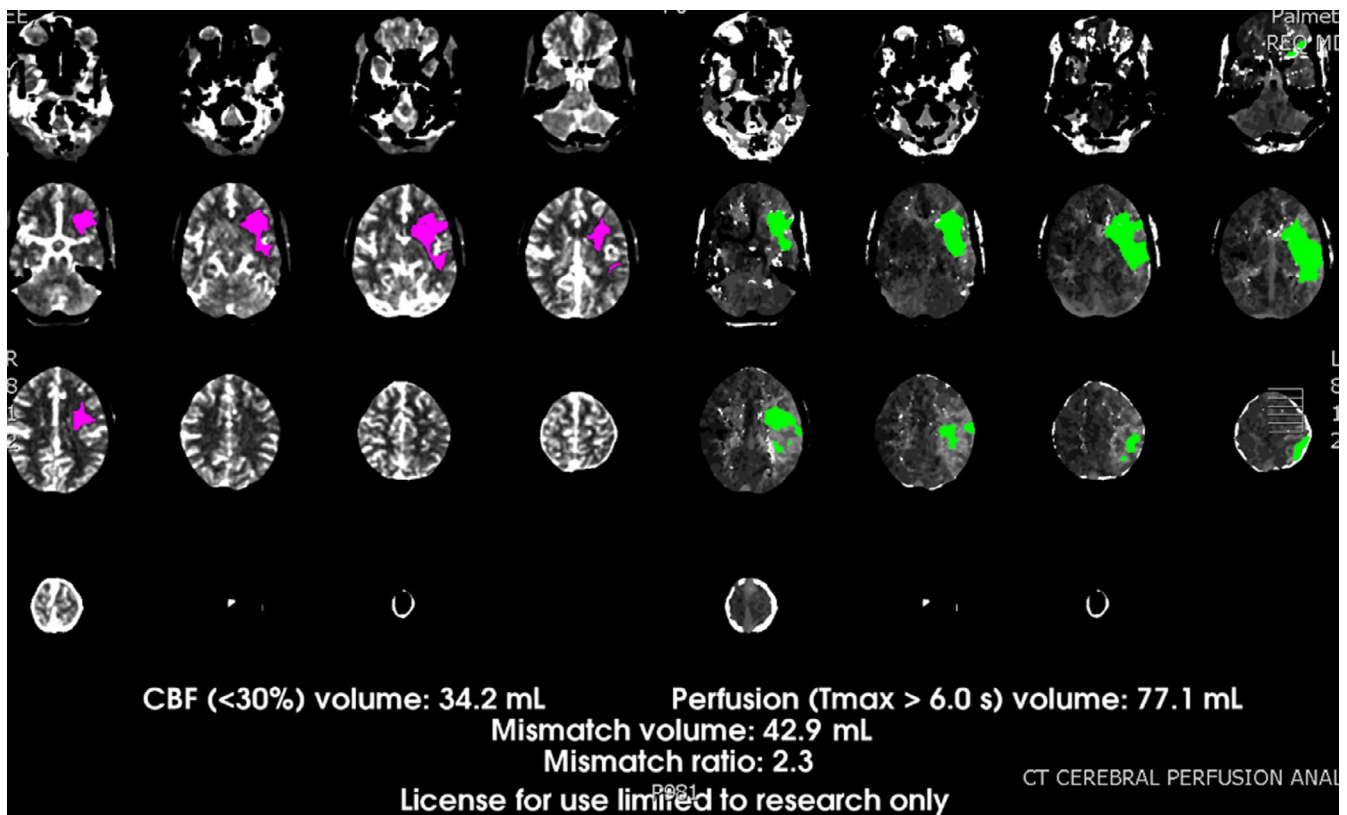


FIGURE 2 CT Perfusion using iSchemaView RAPID Software 1/9/17



FIGURE 3 Cerebral Angiogram showing TIC1 3 reperfusion post-thrombectomy 1/9/17

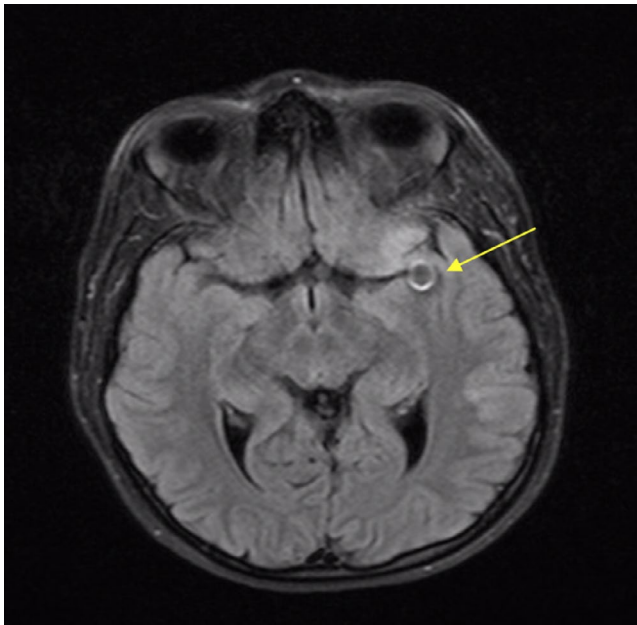


FIGURE 4 Axial, T2 TIRM-TRA-Dark fluid MR Brain without contrast showing Blooming Artifact 1/10/17

a result, the patient was placed on dual antiplatelet therapy (DAPT).

The patient continued to improve with inpatient rehabilitation. She gained significant improvement in language and was able to walk with only mild assistance after 1 week. She was discharged home, on DAPT, with home health physical therapy after 8 days. Her NIHSS on discharge was 3.

The patient was discharged on hospital day sixteen and instructed to follow-up in 4-6 weeks. Prior to outpatient follow-up, she delivered, at 39 weeks and 1 day gestation, a healthy female infant at 1034 g with APGAR scores of 8 and

9. She showed improved symptoms on follow-up with mild aphasia and drift for an NIHSS of 2. A follow-up CT angiogram showed patent anterior, middle, and posterior cerebral arteries with no flow-limiting stenoses evident. No transcranial doppler was performed. Additional MRI continued to demonstrate the artifact, and the decision was made to keep her DAPT. Six months later, DAPT was discontinued, due to bruising, in favor of single aspirin 81mg for global stroke secondary prevention.

3 | DISCUSSION

Catheter remnants after mechanical thrombectomy are a complication that has not been reported in the literature for stroke. Interestingly, catheter remnants are a rare, but reported complication of coronary catheterization and angioplasty, as well as endovascular treatment of intracranial aneurysms.^{4,5} On MRI, a paramagnetic material produces a susceptibility artifact known as a “Blooming” artifact due to the interference generated in the magnetic fields. This could be due to a catheter remnant, hemosiderin from a previous hemorrhage, or gas from an air embolism.⁶⁻⁸ We deemed nothing else possible given the nature of the procedure.

The complication rate in acute neuro-endovascular thrombectomy procedures is uncommon and felt to be an acceptable risk given the proven benefits. In a 2016 study of 176 patients, there were complications in 20 of 176 patients (11%). A total of 23 different adverse events were reported including sICH 8 of 176 (5%), emboli to new vascular territories 4 of 176 (2%), dissection 3 of 176 (2%), vasospasm 5 of 176 (3%), stent dislocation in 1 of 42 (2%), and stent occlusion in 2 of 42 (5%).⁹

In the SWIFT trial data, 18 of 144 (12.5%) patients had complications including symptomatic intracranial hemorrhage (4.9%), air emboli (1.4%), vessel dissection (4.2%), major groin complications (2.8%), and emboli to new vascular territories (0.7%).¹⁰

Comparing the Merci with the Solitaire FR retrieval device, the main complications were symptomatic cerebral hemorrhage (10.9% vs 1.1%; $P = .013$); symptomatic SAH (7.3% vs 1.1%; $P = .07$), air emboli (1.8% vs 1.1%; $P = 1.0$), emboli to new vascular territories (1.8% vs 0%; $P = .38$), vessel dissection (1.8% vs 4.5%; $P = .65$), and major groin complications (3.6% vs 7.9%; $P = .48$). Angiographic vasospasm was common but without clinical sequelae.¹⁰

According to the 2019 update of the AHA guidelines for early management of patients with acute ischemic stroke, the first attempt was made with the stent retriever based on level 1A evidence. However, for subsequent cases the choice of aspiration vs. stent retrieval device should be made based on the comfort and/or expertise of the performing proceduralist.

Given the rarity of the complication, it should not alter practice in how endovascular recanalization of acute stroke is performed.¹¹

We present a novel complication in this case as we suspect this “Blooming” artifact seen on MRI was in fact a catheter remnant. Unless otherwise contraindicated, MRI is frequently performed as part of the ongoing stroke work-up to understand both the degree of injury, pathophysiology, and mechanism of the stroke. If a Blooming artifact is present, this should raise suspicion of a possible catheter remnant and subsequent antiplatelet therapy.

As we were unable to find many reported cases of this complication, we did not have good quality of evidence on how to manage this patient. The question presented was as follows: should she be placed on dual antiplatelets for a short period of time the transition into monotherapy or should she stay on DAPT lifelong?

Some anecdotal evidenced-based guidance can be inferred from the cardiac literature where catheter remnants are a reported complication in as many as 1% of cases of percutaneous coronary interventions (PCI). Endovascular retrieval of the entrapped remnants is the preferred option; however, this is not always possible and repeated failed attempts carry the risk of perioperative complications, such as vessel perforation. Conservative medical management with DAPT can be indicated if the patient remains asymptomatic, but patients experiencing ischemia due to thrombosis of the catheter remnants require emergency coronary artery bypass grafting.⁴ Unfortunately, unlike PCI, bypass grafting is not an available salvage option for failed medical management of intracranial catheter remnants.

4 | CONCLUSION

Much like the presence of a bare-metal endovascular stent within the cerebral vasculature, catheter fragments can be viewed clinically as a foreign body, representing a risk for future ischemic events if not managed appropriately. It is the opinion of the authors that medical management should include DAPT with aspirin and clopidogrel, as long as the catheter fragments are present. We will continue to monitor with follow-up imaging.

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CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

John Coward: served as a member of medical team for the case and primary author of the case report. Jillian Prier:

served as a secondary author and primary editor of the case report. Julian Duda: served as a senior resident of the medical team for the case. Anil Yallapragada: served as attending physician for the case.

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