Snaring of a Glued Microcatheter During Embolization of an Arteriovenous Malformation with *N*-Butyl Cyanoacrylate

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■ BACKGROUND: **Microcatheter entrapment during embolization of brain arteriovenous malformations (AVMs) represents a potentially harmful technical complication. Although several techniques have been reported for endovascular catheter retrieval from an Onyx cast, such methods have never been demonstrated with acrylic glues. We report a case of removal of a glued microcatheter from an *N*-butyl cyanoacrylate (NBCA) cast using a microsnare.**

■ METHODS AND RESULTS: **A 26-year-old woman presented with an intracranial hemorrhage resulting from a ruptured right choroidal AVM. A microcatheter used for transarterial embolization was unintentionally glued into the NBCA cast. Because attempts to remove the catheter by simple traction failed, a microsnare was used and allowed withdrawal of the entrapped microcatheter without causing damage to the cerebral vasculature. The patient woke up without clinical sequelae.**

■ CONCLUSIONS: **Although it is not recommended as routine practice, snaring a glued microcatheter is feasible and can be used in selected cases as a last resort if thromboembolic complications are feared.**

INTRODUCTION

Microcatheter entrapment during embolization of a brain arteriovenous malformation (AVM) with liquid embolic agents is a known and feared technical complication that can lead to serious thromboembolic complications. Catheter entrapment may occur in cases of severe vessel tortuosity, especially in posterior fossa lesions, or when excessive reflux is not noted in time. If acrylic glues are used, this adverse event is usually seen with faster than expected polymerization, early reflux, or improper injection technique.[1-3] Endovascular microcatheter removal from an nonadhesive Onyx cast is often possible using various techniques.[4-8] However, the same has not been described for acrylic glues, wherein the microcatheter's adhesion to the vessel wall may be particularly problematic during attempts to withdraw the catheter.[9] Forceful removal of such a "glued catheter" could lead to severe vessel damage with serious clinical consequences. We report the successful removal of a microcatheter from an *N*-butyl cyanoacrylate (NBCA) cast by snaring the catheter tip in a patient with a choroidal AVM.

CASE REPORT

A 26-year-old woman presented because of headaches and vomiting for 11 days. She initially underwent diagnostic computed tomography, and a large intraventricular hemorrhage was found (Figure 1A). Computed tomographic angiography and digital subtraction angiography revealed a right choroidal AVM (Spetzler-Martin grade 4) with deep venous drainage and a prenidal aneurysm (Figure 1B and C) arising from the distal anterior choroidal artery (AchA). The aneurysm was considered the acute bleeding source, and the patient elected to proceed with coil occlusion to be followed by staged nidus embolization. In our institution, ruptured AVMs are embolized in the acute phase only when a possible target can be identified as likely source of rupture.

The aneurysm was selectively catheterized using a triaxial system with a 6-Fr Neuron MAX guiding catheter (Penumbra, California, USA), a Sofia 55 distal access catheter (MicroVention, Aliso Viejo, California, USA), and a Headway Duo catheter (MicroVention). Subsequent coil packing allowed occlusion of the aneurysm (Figure 1D). Owing to a favorable angioarchitecture immediately distal to the aneurysm seen in superselective runs, it was then decided to add an attempt of nidus embolization (Figure 2A).

Key words
- Arteriovenous malformation
- Glued catheter
- *N*-butyl cyanoacrylate
- Snaring

Abbreviations and Acronyms
AchA: Anterior choroidal artery
AVM: Arteriovenous malformation
EVT: Endovascular option of treatment
NBCA: *N*-butyl cyanoacrylate

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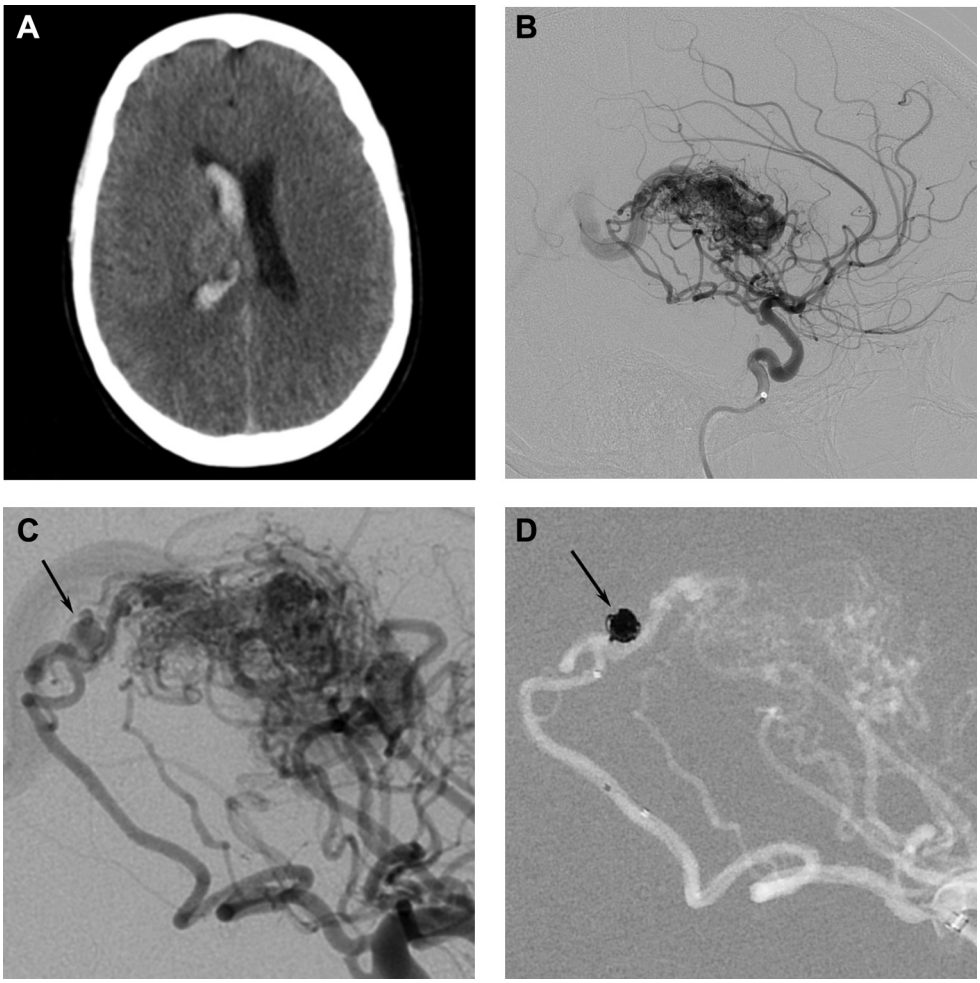

Figure 1. (**A**) Axial computed tomographic scan showing right intracerebral and intraventricular hemorrhage. (**B**, **C**) Right internal carotid artery injection revealing a prenidal aneurysm (*arrow* in **C**) arising from the distal anterior choroidal artery associated with the arteriovenous malformation. (**D**) Selective occlusion of the aneurysm using coils (*arrow*).

A Marathon microcatheter (Medtronic, Minneapolis, Minnesota, USA) was navigated distally to embolize a posterior nidus compartment using acrylic glue. A mixture of 33% NBCA (Glubran, GEM Srl, Viareggio, Italy) and 67% ethiodized oil (Lipiodol, Guerbet, Aulnay-sous-Bois, France) was prepared, and 0.2 mL of the NBCA mixture was injected under biplane subtracted fluoroscopy (blank road map). During this injection, reflux occurred earlier than expected and before relevant nidus penetration and glued the catheter tip rapidly into the distal feeder (Figure 2B). Immediate attempts to carefully withdraw the microcatheter by simple pulling of its proximal end failed. Because leaving the microcatheter in the AchA was considered exposing the patient to a significant risk of thromboembolic complications in a sensitive territory, endovascular catheter removal was discussed in our team and then performed. First, a buddy-catheter technique[10] using a second microcatheter (Headway Duo, MicroVention) that was advanced in parallel to the Marathon into the distal AchA was attempted but failed to free the glued microcatheter (Figure 2C). Therefore, the hub of the Marathon microcatheter was cut off allowing for removal of the Sofia 55 catheter. Then, a 2-mm Amplatz Goose-Neck microsnare (Medtronic) was slid over the end of the entrapped microcatheter and slowly advanced along this catheter to its distal end. This was supported by slightly pulling back the entrapped Marathon to straighten the course of the AchA. The snare was then tightened around the catheter's tip as closely as possible to the NBCA cast (Figure 2D). Repeated, gentle, and simultaneous pulling of both the trapped microcatheter and the snare was applied over approximately 10 minutes. Whereas it appeared not possible to grab the glue surrounding the catheter itself to break it off, repeated alternate pulling and relaxing the system eventually resulted in freeing and removal of the microcatheter (Figure 2E). Immediate postprocedure digital subtraction angiography run showed no noticeable spasm, dissection, or extravasation (Figure 2F). The patient woke up with no new deficits and had an uneventful postoperative course.