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Short Communication

Microcatheter Entrapment after Embolization of Arteriovenous Malformation - Incidental Finding 30-Year after Procedure

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Abstract

Introduction: Microcatheter entrapment is an uncommon although well-known complication associated with cerebral arteriovenous malformations (AVM) that could lead to severe complications although removal catheter is no exempt of complications either such as severe vessel damage.

Report: We described the finding and management of microcatheter entrapment in a woman with cerebral AVM embolized 30-year after procedure.

Conclusion: Removal of the catheter procedure is only recommended in specific cases. In most cases, medical therapy with antiplatelet or anticoagulant therapy is usually recommended.

ABBREVIATIONS

AVM: Cerebral Arteriovenous Malformations; NBCA: N-Butil-Cyanoacrylate; PVA: Polyvinyl Alcohol Particles; EVOH: Ethylene – Vinyl Copolymer; DMSO: Dimethyl Sulfoxide

INTRODUCTION

Catheter entrapment during arteriovenous embolization is an uncommon complication that could lead to thromboembolic complications [1,2].

Nowadays, this complication has been reduced due to the improvement in the embolization technique and high-tech devices such as new micro catheters with detachable tip and the replacement of cyanoacrylate as the most commonly employed embolic agent. The development and employ of ethylene vinyl alcohol copolymer in dimethyl sulfoxide (Onyx, eV3, California, USA) have changed the perspective of arteriovenous malformation embolization because of its non-adhesive properties reducing the risk of entrapment catheter in comparison with N-butil-cyanoacrylate (NBCA) [3].

We report the incidental finding of catheter entrapment in a patient with seizures and transient vision loss with a history of cerebral arteriovenous malformation (AVM) embolization with butyl-cyanoacrylate in 1994.

REPORT

A 42-year-old woman was referred to our outpatient clinic to be assessed by left internal carotid catheter incidental finding. She had a history of treated arteriovenous malformation before.

In 1994, at the age of 13, the patient was admitted with spontaneous intra cerebral bleeding in the left parietal area, associated with headache symptoms. An arteriovenous malformation was found in the left parietal area. She was treated by embolization therapy with NBCA with clinical improvement. Follow up revealed recanalization of the AVM in 2005, requiring treatment with radiosurgery. Afterwards, symptoms disappeared and she remained asymptomatic.

In 2010, she presented at the emergency department for self-limited, paroxysmal and stereotyped episodes lasting a few minutes of periocular paresthesia on the right-sided hemiface associated with transient vision loss. An urgent cranial CT scan was performed revealing AVM embolized, the catheter was found incidentally in the left common and internal carotid artery, reaching the AVM embolized area [Figure 1]. Antiepileptic drug monotherapy was started since sensory partial seizures could not be dismissed.

The follow up did not reveal significant changes. The frequency of epileptic seizures decreased, although transient visual loss occurred sporadically.

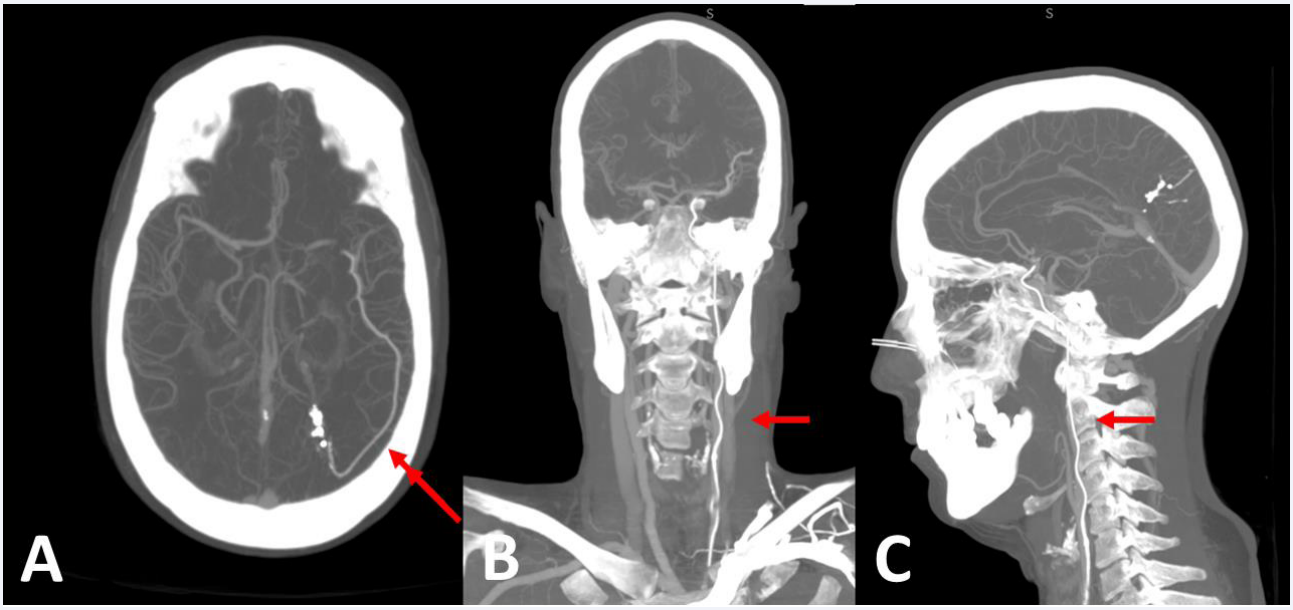

Figure 1 Axial computed tomographic scan showing arteriovenous malformation embolized with presence of microcatheter glued to it. Arrows showing presence on cerebral median branch (A), common carotid artery (B, C).

In addition to antiepileptic therapy, single antiplatelet treatment with clopidogrel was introduced in our outpatient visit as well as a new CT scan where it was evidenced the presence of catheter fragments in the aorta and right common femoral artery without significant stenosis at this level. Physical examination was also without findings. Surgical treatment to remove catheter fragments was discarded due to the length of the affected area, the time since the event and the absence of symptoms during the follow up.

DISCUSSION

Endovascular AVM embolization is well-accepted as treatment and in some cases, as a complement to other treatment modalities including microsurgical resection or stereotactic radiosurgery. Wide variety of embolic agents have been employed. At present, NBCA, Onyx and, to a lesser extent, platinum coils and polyvinyl alcohol particles (PVA) are approved by the Food and Drug Administration to embolize AVMs [3-6].

NBCA polymerizes almost instantaneously when it comes in contact with ionic fluid, offering increased permanence and durability compared with PVA embolization due to the significant vascular inflammatory reaction. In spite of this, recanalization may occur as well as a high risk of microcatheter adhesion due to the fast polymerization [7].

Onyx is a more recently developed embolic agent available in three premixed concentrations of increasing viscosity, composed of ethylene – vinyl copolymer (EVOH) and micronized tantalum powder suspended in dimethyl sulfoxide (DMSO). When it is injected into an aqueous medium, DMSO diffuses and is eventually exhaled by alveolar diffusion. This process causes the EVOH/tantalum mixture to precipitate into the vessel lumen, promoting vessel occlusion [3,8].

Onyx injection is carried out gradually and angiography - controlled to achieve precise delivery. As soon as a reflux is observed along the microcatheter, the injection is stopped for a few minutes and then can be resumed. Prolonged and repeated injections are allowed [8].

Compared with NBCA, Onyx solidifies slowly while the DMSO solvent diffuses, reducing the risk of microcatheter entrapment. In addition, it has less thrombogenic and inflammatory risk compared with NBCA [1] [Table 1].

Microcatheter entrapment has been described mainly with Onyx and NBCA [1]. In our case, catheter entrapment was produced while NBCA employment as embolic agent. In 1994, not much experience with the use of Onyx as an embolic agent had yet been described. The application of Onyx in the endovascular treatment of cerebral AVM was first described in the early 1990s [9]. Onyx properties meant a lower risk of technical and clinical complications leading to a progressive decrease in the use of NBCA over the years.

Table 1: Comparison of embolic agents

ONYX	NBCA
Precipitation	Polymerization
Cohesive	Adhesive
Slow injection	Fast injection
Low thrombogenicity and inflammation	High thrombogenicity and inflammation
Angiographic monitoring	No angiographic monitoring

Abbreviations: NBCA: N-butyl cyanoacrylate

Risk of microcatheter entrapment within the embolization has been reported between 1.6% and 11.6% with NBCA employment and between 4.3% and 11.1% with Onyx [1-10,11]. Baharvahdat et al. [12], analyzed 846 procedures in 408 patients with cerebral AVM over a 10-year period with 827 successful procedures. Onyx was used in 669 patients (81%) and NBCA in 158 patients (19%). Both embolic agents were employed in 93 patients (11%). Complications were reported in 206 (25%), including cerebral hemorrhage in 92 (11%), postoperative ischemia in 53 (6%), catheter entrapment in 49 (6%), and catheter rupture in 12 (2%).

Microcatheter entrapment could lead to severe clinical complications such as ischemic events, neurological deterioration and subarachnoid or intra parenchymal hemorrhage, even catheter fractures have been documented. Nevertheless, it is recommended to leave the microcatheter once trapped to avoid potential vessel rupture [10,11-13]. When there is no indication for early surgical removal of the microcatheter, there is usually no associated long-term clinical complication, remaining asymptomatic, although antiplatelet or anticoagulant therapy is recommended [1]. In our case, the patient is currently asymptomatic.

In order to overcome this complication, detachable tip micro catheters, such as the Apollo (Covidien, Mansfield, Massachusetts, USA) and Sonic (Balt, France) catheters, were designed and developed. Entrapment of the microcatheter has progressively decreased, especially with Onyx. Onyx injection has a longer time interval to remove the catheter than NBCA. If it remains stuck, the tip could be detached at the embolization site, allowing the rest of the catheter to be removed [14,15].

Miller et al. [15]., analyzed a total of 58 Onyx embolization procedures performed in 37 patients in the head, neck, and spine with the Apollo microcatheter over a 2-year period. Detachment of the distal tip of the microcatheter tip in the liquid embolic cast upon device removal was reported in 73.7% of the cases with no microcatheter entrapment, premature/inadvertent tip detachment, or arterial pedicle injury on microcatheter removal described.

CONCLUSION

Microcatheter entrapment is a potential drawback within endovascular AVM embolization procedures, particularly with NBCA employment.

Over the last few years, new liquid embolic agents have become available that have improved the efficacy of endovascular AVMs treatment as well as the development of detachable-tip micro catheters facilitate catheter removal avoiding risk of microcatheter entrapment.

Nevertheless, in those patients with history of microcatheter entrapment. Catheter removal could lead to severe complications. In the acute phase, removal trying is contemplated in those patients with associated complications such as neurological impairment or local bleeding. In the rest of the cases, the recommendation is to leave the catheter to avoid removal complications. Long - term follow- up showed no further symptoms in most of the cases.

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