Trapped Microcatheter from Vessel Spasm: Safe Removal after Double Microcatheter Technique and Local Papaverine Infusion

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Summary

In a child undergoing combined transarterial and direct percutaneous puncture embolization of an extensive and complex facial arteriovenous malformation, severe arterial spasm fixed a flow-directed microcatheter in an ethmoidal branch of the left ophthalmic artery. Multiple traction attempts failed to remove the microcatheter. After catheterization of the distal, post central retinal artery part of the same ophthalmic artery, with a second flow-directed microcatheter and following intraarterial papaverine injection through this second microcatheter, the fixed microcatheter could be removed without complication. This case demonstrates a technique that can be attempted before deciding to leave the microcatheter in the patient or to remove it surgically.

Introduction

In the few reported cases of glued microcatheters, most occurred during brain arteriovenous malformation (AVM) embolization with adhesive liquid embolic agents iso-butyl-2-cyanoacrylate (IBCA) or n-butyl cyanoacrylate (NBCA)¹⁻⁶. More recently, "glued" catheters from severe arterial spasm have been reported in brain AVM embolization with the non-adhesive liquid embolic agent Onyx⁷. Although the natural history of retained micro-

catheter fragments is not well known, they pose a risk for thromboembolism to patients^{6,8}. Therefore, safe endovascular attempts should be considered before deciding to retain a microcatheter at the access site^{2,3} or before considering surgical removal^{3,5,8}. We present a case of a fixed microcatheter in the ophthalmic artery caused by severe arterial spasm that was successfully removed after catheterization of the same artery with another microcatheter and selective intraarterial infusion of papaverine.

Case Report

A 13-year-old boy with an extensive left facial AVM involving the supraorbital, palpebral, nasal, perioral, and submental areas was referred for endovascular treatment. The lesion was first noticed a few months after birth and initially regressed after laser therapy. However, despite multiple laser treatments, the lesion continued to grow. Under general anaesthesia, diagnostic angiography showed that the mainly fistulous facial AVM was supplied from the left ophthalmic artery, as well as from numerous feeders from a dysplastic facial artery, the superficial temporal artery and the distal internal maxillary artery (Figure 1).

A flow-directed microcatheter (1.5 Spinnaker Elite; Boston Scientific, Natick, MA) was selectively advanced into the left ophthalmic

Figure 1 Lateral view, left common carotid angiogram shows the fistulous facial AVM supplied from the ophthalmic artery, as well as numerous feeders from a dysplastic facial artery, the superficial temporal artery and to a lesser degree the internal maxillary artery.

Figure 2 Unsubtracted lateral view shows distal supraorbital branch injection of the ophthalmic artery (arrowhead points to microcatheter tip). Note normal undulating course of the ophthalmic artery (arrow).

artery into the feeding supraorbital branch of the ophthalmic artery but the fistula site could not be reached due to the tortuosity of the feeding vessel. The microcatheter was left in place for later particle embolization. Direct puncture into the fistulous vein was performed and injection into the facial AVM fistulous compartment was performed with NBCA while the enlarged draining vein was manually compressed (Figure 2). Control angiography of the left ophthalmic artery through the microcatheter showed occlusion of the large fistula with persistent several smaller fistulae which were embolized with small polyvinyl alcohol (PVA) particles. When we attempted to remove the microcatheter, the ophthalmic artery straightened and we could not remove the microcatheter safely. After multiple attempts at mechanical removal with traction with and without microguidewire support over the next hour, the microcatheter remained fixed.

Access was then obtained in the left groin and another guiding catheter was placed in the left internal carotid artery. We advanced another flow-directed microcatheter of the same type into the left ophthalmic artery and advanced the tip of this second microcatheter proximal to the tip of the first microcatheter,

distal to the origin of the central retinal artery (Figure 3). Intraarterial papaverine was injected through this second microcatheter. Mechanical retraction was then again attempted and the previously fixed microcatheter was removed without complication (Figure 4). Control angiography showed continued choroidal blush (Figure 5). After the procedure, the patient was unchanged neurologically and was discharged two days later.

Discussion

Our case illustrates the management of an endovascular complication that is uncommon but one that may be more frequently encountered with the commercial introduction of Onyx™, a non-adhesive liquid embolic agent for brain AVM embolization^{7,9,10}. For example, in a recent study of ten brain AVM patients treated with Onyx™, Florio et Al report that four of 22 injections resulted in a stuck microcatheter from severe arterial spasm⁷. In our patient severe arterial spasm of the distal ophthalmic artery was encountered, thought to have been caused by manual compression during direct puncture glue injection. Because the microcatheter behaved as if it was glued (with

the tip remaining free, as contrast material and later PVA injection could be performed), multiple tractions on the flow-directed microcatheter caused unphysiologic straightening of the ophthalmic artery. Experience suggested that more forceful traction would either tear the artery causing hemorrhagic or break the microcatheter in its distal segment leading to possible early or late complications⁸. In particular, violently removing the microcatheter in our patient could have led to a retroorbital hemorrhage with vision loss or in case of a proximal tear of the microcatheter an occlusive tangle of rolled up catheter fragment in the internal carotid artery. Leaving the microcatheter in place might provoke thrombosis of the ophthalmic artery, be a source of future emboli, incite an inflammatory or proliferative response, and may be a risk factor for accelerated atherosclerosis⁸. Therefore, considerations of permanently retaining the microcatheter at the femoral puncture site^{2,3}, surgical removal^{3,5,8}, and heparinization overnight with further attempts at mechanical traction the next day did not seem optimal.

Although the severe arterial spasm may have eventually resolved spontaneously, after an hour of removal attempts with mechanical traction, no change in microcatheter position oc-

Figure 3 After direct puncture embolization of the dominant fistula during manual venous compression, the microcatheter was fixed secondary to severe arterial spasm. Lateral unsubtracted view shows double microcatheterization with a second microcatheter in the ophthalmic artery distal to the origin of the central retinal artery (arrowheads show both microcatheter tips). Note two guiding catheters in the left ICA (arrows).

curred. After double microcatheterization of the left ophthalmic artery and intraarterial papaverine infusion over the next 15 minutes, gradual movement of the microcatheter tip was

Figure 4 After local intraarterial papaverine infusion using double microcatheter technique the spasm was released and the fixed microcatheter was removed without incident.

Figure 5 Lateral view, left common carotid angiogram after embolization shows subtotal obliteration of the facial AVM. Note the persistent choroidal blush (arrow) and normal course of left ophthalmic artery without evidence of spasm.

noticed until finally the microcatheter was removed intact. It is unknown if antispasmodic infusion performed globally through the guiding catheter would have achieved the same result and whether this should be considered first. It is also unknown if another antispasmodic such as intraarterial nitroglycerine would have achieved the same result. Nevertheless, our case suggests that severe spasm that fixes or traps a microcatheter can respond to a locally infused antispasmodic agent. It is unknown, however, if the severe spasm encountered during Onyx™ embolization will have a similar response. Our case also shows that double microcatheterization of an ophthalmic artery distal to the origin of the central retinal artery is technically feasible and potentially useful. This technique was suggested by the experience of the senior author who routinely and safely uses

multiple simultaneous microcatheters without systemic heparinization in brain AVM embolization procedures^{11,12}.

Conclusions

Interventionalists should not so readily accept the finality of a fixed microcatheter caused by severe arterial spasm. Before subjecting patients to the early and late thromboembolism risks of a permanently retained microcatheter or the risks of surgical removal, further endovascular attempts should be considered. Our case suggests that severe arterial spasm may respond to a locally administered antispasmodic such as papaverine. Double microcatheter technique should be considered to deliver antispasmodics locally to microcatheters glued by severe arterial spasm.

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