Retained and Fractured Microcatheter: a Cause of Transient Ischaemic Attacks: Endovascular Management Using Carotid Stents

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Summary

A retained microcatheter is a rare complication of endovascular treatment of cerebral aneurysms. We describe such a case that was complicated by delayed microcatheter fracture within the internal carotid artery and subsequent thrombo-embolism resulting in transient ischaemic attacks. We also describe endovascular management of this complication through the use of several carotid stents.

Case Report

A 54-year-old man underwent elective endovascular coil occlusion of an 8 mm, wide neck anterior communicating artery aneurysm. An Echelon 14 microcatheter (ev3, now Covidien, USA) was used to catheterise the aneurysm and optimal, successful deployment of the initial framing coil (8 mm×20 mm 3D GDC, Boston Scientific, now Stryker) was achieved. The majority of the second coil (7 mm×17 mm, Cashmere, Micrus Corp, now Codman) was deployed but on attempts to manipulate the entire coil into the aneurysm, the coil was stretched and could not be deployed. Coil loops had knotted within the aneurysm and the microcatheter could not be removed either (Figure 1). The contralateral femoral artery was punctured, the left internal carotid artery catheterised and a second microcatheter was manipulated into the aneurysm. Further coils were

deployed through the second microcatheter achieving satisfactory aneurysm occlusion without additional complication. A decision was made to transect the first microcatheter and stretched coil at the groin, leaving the system within the patient. The proximal end of the microcatheter/stretched coil complex retracted into the external iliac artery.

The patient was initially treated with 500 mg intravenous aspirin. On reversal of anaesthesia, the patient remained neurologically intact. He was heparinised for 24 hours. Post procedure, he received aspirin 75 mg for three months and clopidogrel 75 mg for one month. He remained well until three years later he experienced an episode of transient right arm and leg weakness. An unenhanced CT demonstrated no evidence of infarction and CT angiography confirmed that the microcatheter was intact and no thrombus was seen in association with the microcatheter. He was maintained on antiplatelet therapy but re-presented a month later with a further, similar transient ischaemic attack. Carotid Doppler ultrasound identified a fracture of the microcatheter/stretched coil complex at the carotid bifurcation. The microcatheter was mobile within the vessel and associated with thrombus distal to the fractured proximal limb. This was confirmed with CT angiography (Figure 2). The high density seen at the fracture ends indicated that the fracture of the stretched coil had probably occurred at the transition zone. This had possibly resulted in subsequent microcatheter fracture. No single precipitating

← *Figure 1* Oblique unsubtracted image of the stretched coil within the anterior communicating artery aneurysm and retained microcatheter. Note the proximal marker of the microcatheter (arrow) and tapering stretched coil proximal to this.

Figure 2 Axial, coronal and sagittal cranio-cervical CT angiographic images demonstrate low density thrombus associated with the distal end of the proximal fragment of retained microcatheter (arrows). ↓

Figure 3 Longitudinal (left) and transverse (right) ultrasound images demonstrating the retained microcatheter with associated thrombus formation within the left internal carotid artery (arrows).

event could be identified in the clinical history to account for the microcatheter/stretched coil fracture. It was speculated that this was secondary to repeated stress with neck movement resulting in chronic transition zone weakening and subsequent fracture.

The patient was anticoagulated with warfarin. Repeat Doppler ultrasound two weeks later showed minimal residual thrombus (Figure 3).

Open surgery by carotid arteriotomy with resection of the free proximal end of the catheter and transfixation to the vessel wall was considered, but an endovascular approach was considered to be less invasive and likely to be equally durable. The decision was made to undertake carotid stenting in order to anchor both the proximal and distal ends of the fractured microcatheter, reduce flow disturbance and the risk of thromboemboli.

The procedure was performed under general anaesthesia, systemic heparinisation and following loading with clopidogrel 600 mg and aspirin 300 mg.

Initial angiography confirmed microcatheter fracture with free mobile ends in the internal carotid and common carotid arteries (Figure 4). The proximal end of the distal microcatheter/stretched coil fragment in the proximal internal carotid artery was anchored using a Wallstent, (Boston Scientific) 5 mm×30 mm (Figure 5) and the distal end of the proximal microcatheter fragment in the common carotid artery with an additional Wallstent 9 mm×30 mm (Figure 6). Stents were deployed in a tandem manner to ensure that the free-ends of the microcatheter/stretched coil fragments were secured and isolated from the arterial lumen. There were no complications during the procedure. The patient was maintained on clopidogrel 75 mg for six weeks and aspirin 75 mg for life. He remains well.

Follow-up Doppler ultrasound two months later confirmed a satisfactory appearance with minimal carotid bifurcation atheromatous change, no thrombus and no flow disturbance.

Discussion

Although rare, entrapment of a microcatheter during endovascular embolization of cerebral arteriovenous malformations using either onyx^{1,2} or N-butyl cyanoacrylate³ is well-described in the literature. Retention of microcatheters during coil embolization of cerebral

Figure 4 Initial frontal left common carotid angiogram demonstrating the fractured microcatheter with free ends (arrows).

aneurysms is an extremely rare event but has been previously described^{4,5}. It may occur secondary to overlap between coil and pusher wire within the microcatheter tip following detachment, or alternatively secondary to coil detachment system failure with the microcatheter tightly lodged within the aneurysm. Immediate management often involves transection of the microcatheter at the groin, allowing retraction into the common iliac artery, if it is not possible to release the catheter with a snare, surgery or other means¹⁻⁶. Surgery is advocated by some owing to the fear of precipitation of thrombosis

↑ *Figure 5* Deployment of the first Wallstent in the left internal carotid artery (left), excluding the distal limb of the fractured microcatheter (white arrows indicate body of catheter, black arrow indicates free end).

of a major arterial trunk by the retained tubing³. Surgically proven incorporation of the retained microcatheter into the wall of the parent vessel is reported⁷, though chronic complications of the transected free end of the catheter have been described in the groin, resulting in thrombosis and pseudoaneurysm formation of the superficial femoral artery⁷. To our knowledge, this is the first description of a fractured microcatheter within the carotid artery causing subsequent thrombo-embolic complications, and the first description of endovascular management using carotid stenting in order to trap the free ends of the microcatheter to reduce the risk of further thromboembolism.

← *Figure 6* Left frontal common carotid angiogram demonstrating deployed Wallstent excluding the fractured free end of the proximal limb of the microcatheter (arrow).

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