Retrieval of a Migrated Detachable Coil

—Case Report—

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Abstract

A 74-year-old female presented with intraventricular and subarachnoid hemorrhage due to probable rupture of a basilar artery (BA) aneurysm or a superior cerebellar artery (SCA) aneurysm. She was treated by endovascular therapy using detachable coils through the BA. The BA aneurysm was completely occluded, but part of a coil migrated into the BA from the SCA aneurysm during the procedure. The migrated coil was retrieved using a snare type endovascular retrieving device. The snare loop required concentric closure around the coil by simultaneous pulling of the corewire and a slight forward movement of the tip of the snare catheter. The SCA aneurysm was successfully occluded 1 week later using a shorter coil.

Key words: endovascular therapy, foreign body, interlocking detachable coil, intracranial aneurysm, retriever

Introduction

The use of endovascular therapy utilizing platinum or detachable coils has resulted in a few cases of parent vessel occlusion by migrated coils. We report the successful retrieval of a migrated interlocking detachable coil (IDC) from the basilar artery (BA) following migration from a superior cerebellar artery (SCA) aneurysm, and describe the technique used for the manipulation of the endovascular retrieval device.

Case Report

A 74-year-old female was admitted to our hospital with loss of consciousness on November 26, 1993. She was in a semicomatose condition with nuchal rigidity. Her neurological status was Hunt and Kosnik grade 4 with a score of 7 on the Glasgow Coma Scale. Nine years before admission, she had undergone clipping of a right internal carotid-posterior communicating artery (IC-PCoM) aneurysm in another hospital. On admission, computed tomography (CT) showed intraventricular and subarachnoid hemorrhage with acute hydrocephalus.

Fig. 1 *upper:* Vertebrobasilar angiogram showing a large aneurysm at the BA bifurcation and an aneurysm in the proximal left SCA. *lower:* Vertebrobasilar angiogram showing the proximal part of the IDC, which has migrated into the BA. The large aneurysm at the BA bifurcation is successfully embolized with six IDCs.

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lus. Following ventricular drainage, cerebral angiography demonstrated three intracranial aneurysms: a large aneurysm of a bifurcation of the BA, an aneurysm of the left SCA (Fig. 1 *upper*), and a large aneurysm of a bifurcation of the left middle cerebral artery. The right IC-PComA aneurysm was found to be successfully clipped. Considering the distribution of the hemorrhage on the CT scans, we concluded that the cause of the hemorrhage was rupture of the BA or SCA aneurysm.

On December 14, endovascular treatment was performed with IDCs (Target Therapeutics, Fremont, Cal., U.S.A.). A 6-French introducer was inserted into the left femoral artery under local anesthesia, and a 5-French catheter was guided into the left vertebral artery through this introducer. A 6-French catheter was guided into the right vertebral artery through a 7-French introducer inserted into the right femoral artery. Heparin (4000 U) was then ad-

ministered intravenously for systemic anticoagulation. A special version of the Tracker-18 microcatheter (Target Therapeutics) was then introduced through the guiding 6-French catheter into the BA and directed into the BA aneurysm under direct fluoroscopic visualization and road mapping. Two 7×20 IDCs, two 5×15 IDCs, and two 4×8 IDCs were used to occlude the aneurysm completely (the first number is the diameter of the circular memory⁴ in mm, the second is the length of the coil in cm when straightened).

The tip of the microcatheter was then directed into the left SCA aneurysm, which measured $5 \times 4 \times 3$ mm, and insertion of a 4×8 IDC was attempted. However, the whole coil could not be inserted because tension gradually occurred in the IDC shaft after half of the coil was inserted. The coil was retrieved and 3 cm cut off the distal end. Another attempt was made to insert the shortened coil into the

Fig. 2 Photographs (*upper*) and corresponding illustrations (*lower*) showing the retrieval of the migrated coil. A: The snare catheter (Retriever-18) is advanced into the BA. The snare loop (*arrowheads*) is opened. 1: IDC, 2: snare loop of the Retriever-18, 3: snare catheter of the Retriever-18. B: The snare loop is placed around the proximal part of the migrated coil. The tip of the snare catheter (*arrow*) is not advanced. C: The tip of the snare catheter (*arrow*) is advanced simultaneously with closing of the snare loop. D: The IDC is tightly grasped and slightly pulled down.

Fig. 3 Vertebrobasilar angiogram demonstrating partial occlusion of the left SCA aneurysm and complete occlusion of the BA bifurcation aneurysm with normal filling of parent arteries.

left SCA aneurysm. Immediately after the coil was mechanically detached in the aneurysm, the proximal part migrated into the BA (Fig. 1 lower). Initially, a Retriever-10 (Target Therapeutics) was guided into the BA from the left vertebral artery through the 6-French catheter inserted into the left femoral artery. However, the snare loop of the Retriever-10 could not be opened due to the tortuosity of the left vertebral artery from the second to the fourth segments. The 5-French guiding catheter inserted into the left femoral artery was exchanged for a 6-French size, and the Retriever-18 was guided into the BA. This time, the snare loop of the tip of the Retriever-18 could be opened, and the snare was placed around the proximal part of the migrated coil, which had become U-shaped. The snare loop was slowly closed, but the migrated coil could not be grasped. The snare was again placed around the proximal part of the migrated coil, and the loop was closed and the catheter shaft of the Retriever-18 simultaneously pushed forward to maintain the central point of the snare loop in the same position. By doing so, the migrated coil was caught and could be retrieved (Fig. 2). The Retriever-18, holding the IDC, was then pulled into the guiding catheter and both were removed through the introducer inserted into the left femoral artery. The total time elapsed from the migration of the coil until the retrieval was about 2 hours. The postoperative course was uneventful.

One week later, the left SCA aneurysm was successfully treated with an IDC of 3-mm circular memory and 6-cm length (Fig. 3). A ventriculoperitoneal shunt was implaced on January 10, 1994. She gradually improved except for slight dysmetria of the left hand, and could walk with some support. On May 27, she was discharged from our

hospital.

Discussion

Several cases of migration of the coils used in endovascular therapy have been reported recently. Casasco *et al.*¹⁾ reported that the parent vessel was occluded during positioning of the last coils in four of 71 patients and that the coils used in their series were not retrievable. Guglielmi *et al.*,⁴⁾ who developed the electrically detachable coil,^{3,5)} reported coil migration into the posterior cerebral artery after detachment in one of 43 aneurysms, but did not describe retrieval of the migrated coil.

Graves *et al.*²⁾ first developed the retrieval device (Retriever-10 and Retriever-18; Target Therapeutics) in a canine model, which was modified to incorporate a single wire loop at the distal tip of a Tracker-10 or Tracker-18. Smith *et al.*⁷⁾ presented the first two clinical applications of this microcatheter device for retrieving a microcatheter fragment and a broken guidewire from the vertebrobasilar artery, and a microcatheter fragment from the occipital artery. Recently, Nakamura *et al.*⁶⁾ reported the successful retrieval of a broken Tracker-18 infusion catheter from the sigmoid sinus through the internal jugular vein using a "goose-neck" snare, and emphasized the necessity for preparation of the retrieval catheter. As we could find no reports regarding retrieval of migrated coils from the intracranial arteries during endovascular therapy for intracranial aneurysm, our case is the first clinical report of the successful retrieval of a migrated coil from the intracranial arteries.

Initially we could not open the snare loop of the Retriever-10 due to the tortuosity of the left vertebral artery, but the snare loop of the Retriever-18, which has a larger diameter than the Retriever-10, was easily opened and closed. Smith *et al.*⁷⁾ also noted that the snare of the Retriever-10 did not open or close quite as easily as that of the larger device. We hope that the smaller snare can be improved to allow easier manipulation. We recommend that closure of the snare loop by pulling the corewire be combined with a simultaneous slight forward movement by pushing of the tip of the snare catheter to concentrically grasp the foreign body, such as a coil. If the corewire is only pulled to close the snare loop, the foreign body may escape.

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