Protrusion of coil loop(s) and subsequent occlusion of the parent artery is one of the dreadful complications during endovascular coil embolization of cerebral aneurysm. Although protrusion of one or two coil loops may not cause adverse events and can be ignored in many instances, it can also compromise the parent artery in some cases with or without thrombus formation. We report a case of rescue balloon reposition of the protruding coil mass back into the aneurysm and recanalization of parent artery during embolization of the anterior communicating artery aneurysm.

Key Words: Cerebral aneurysm; Complication; Endovascular treatment; Detachable coil; Balloon

CASE REPORT

A 51-year-old man presented with sudden onset of severe headache. Computed tomography (CT) revealed diffuse subarachnoid hemorrhage (SAH) with localized clot in the anterior interhemispheric cistern (Fig. 1A). His clinical status was Hunt and Hess grade II. Left internal carotid angiogram demonstrated a lobulated, wide-necked aneurysm of the ACoA (Fig. 1B).

Under general anesthesia, a 6-F Envoy guiding catheter (Cordis Endovascular, Miami Lakes, Fl.) was placed in the left internal carotid artery (ICA). A Rebar-14 microcatheter (Micro Therapeutics, Inc., Irvine, CA) was then navigated into the aneurysm sac using 0.010 inch Silverspeed microguidewire (Micro Therapeutics). A complex Trufill detachable coil (5 mm diameter × 5 cm length, Cordis Endovascular) was placed within the larger aneurysm sac without difficulty (Fig. 2A). However, two coil loops protruded into the parent artery when the coil was detached (Fig. 2B). There was no adverse effect at that moment. Subsequently, two detachable coils were delivered into...
the aneurysm for further packing: 4 mm × 6 cm soft Guglielmi detachable coil (GDC, Boston Scientific/Target Therapeutics, Fremont, CA) and 2 mm × 4 cm ultrasoft GDC. The protruding coils loops compromise the parent artery slightly more during the placement of the third coil. After intra-aneurysmal positioning of the three detachable coils, a small thrombus was observed at A1/A2 junction of the left anterior cerebral artery (ACA) around the protruding coil loops (Fig. 2C). Although 4000 U of heparin bolus was immediately administered intravenously, thrombus size increased more and more and the left anterior cerebral artery flow was arrested soon after (Fig. 2D). We then decided to do the rescue balloon reposition of the protruding coil mass. A 3.5 mm diameter × 10 mm length, nondetachable Sentry microballoon catheter (Boston Scientific/Target Therapeutics) was placed across the aneurysm neck (Fig. 3A). After 30-second inflation of the microballoon with care, the protruding coil mass and thrombus were successfully repositioned back into the aneurysm and ACoA and the left ACA was reopened completely (Fig. 3B and 3C). Final angiography demonstrated exclusion of the aneurysm sac and excellent flow in the left ACA with no residual narrowing (Fig. 3D). Although ACoA was occluded by the replaced coil mass, the contralateral ACA was supplied from the right internal carotid artery (Fig. 3E). The patient was recovered from anesthesia and woke up neurologically unchanged (Hunt and Hess grade II). He made a good recovery from the effects of SAH and was discharged home without neurological deficit.

DISCUSSION

Even with rapid improvement of the endovascular treatment of the cerebral aneurysm, placement of detachable coils is not without complication. Potential complications of detachable coil embolization include aneurysm perforation, failure to achieve complete packing of the aneurysm, parent vessel thrombosis, distal thromboembolism, coil protrusion or migration, coil stretch, parent artery occlusion, rebleeding, aneurysm regrowth, and so on. Particularly in cases of coil protrusion from the aneurysm, the thromboembolic complication may increase. Conventional management of protruding coils consists of removal and repositioning prior to electrolytic detachment, or the use of a snare or guidewire for removal when already detached (1, 2). Occasionally, the protruding coil is left in place even after multiple attempt to remove or reposition. Many cases of these situation can be treated with anticoagulation uneventfully. In some cases, however,
the patient may suffer from cerebral infarction due to parent artery occlusion or distal thromboembolism.

The balloon remodelling technique have been reported as an effective adjunct for the treatment of wide-neck aneurysm (3, 4). This method was originally used to prevent coil protrusion into the parent artery. This technique has provided interventional neuroradiologists with a greater chance to treat wide-neck aneurysms safely with detachable coils, although the procedure is more complicated and temporary flow arrest of the parent artery is required. In our case, we tried a technical modification of microballoon use for reposition of the protruded coil mass back into the aneurysm after intraaneurysmal coil placement.

Snare retrieval device can be used for protruding coil, but removing a significant coil mass is also technically difficult, as well as potentially hazardous, with significant risk of thromboembolic complication, vessel perforation, and malpositioning of another coil(s) previously detached (1, 4, 5). We believe it is better to place the protruding coil loops back into the aneurysm sac by inflating the microballoon or microstent placement. There are a few reports of intracranial stenting for repositioning and trapping of the protruding coil loop(s) by use of coronary stent (2, 4). Currently, self-expandable intracranial stent - the Neuroform stent (Boston Scientific/Target) - can be navigated easily through the intracranial vasculature and deployed across a more distal aneurysm. This rescue technique with stent placement has become an attractive method to sequester herniated coils from the lumen of the parent artery (1, 6). There are, however, a

![Fig. 2. A. Left internal carotid arteriogram obtained after placement (before detachment) of the first coil within the larger sac of aneurysm, creating a good coil basket. There was no coil protrusion. B. After placement of the second coil. Two coil loops, which protruded immediately after detachment of the first coil, are noted in the the parent artery lumen at A1/A2 junction of the left anterior cerebral artery. There was no flow compromise at that time. C. After completion of the embolization procedure. The protruding coils loops compromise slightly more the left anterior cerebral artery, and a small thrombus has formed around the protruding coil loops, manifesting as a filling defect in the left anterior cerebral artery (arrow). D. Anterior-posterior (A-P) view of the left internal carotid arteriogram after IV heparinization. The left anterior cerebral artery flow was significantly diminished (arrow) and completely arrested soon after (not shown).]
limitation in this approach. Thrombogenicity of the stent remains a concern, as evidenced by cases of acute in-stent thrombosis and thromboembolism reported in early clinical series (7, 8). With the Neuroform stent, patients should be pretreated with antiplatelet drugs (a combination of aspirin and clopidogrel for at least 3 days before the procedure) (7). This can be easily achieved in patients with unruptured aneurysms but is problematic in patients with ruptured aneurysms. In such patients, it can be suggested that clopidogrel and aspirin be administered in loading doses during or shortly after the procedure through a nasogastric tube. Alternatively, the rescue balloon technique is used to avoid the problems of antiplatelet therapy in this situation.

In conclusion, coil protrusion into the parent vessel may lead to thromboembolic complication even with heparinization, especially if the protruded coil loops compromise the vessel lumen. In such situations rescue reposition technique using microballoon or microstent should be considered.

References
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