Endovascular Retrieval of Migrated Coil within the Distal Middle Cerebral Artery Using Stentriever Device

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BACKGROUND: **Displacement of endovascular coils during endovascular embolization of an intracranial aneurysm is a potentially life-threatening complication. Several methods for coil retrieval have been described, including the use of microsnares and microforceps retrieval devices. With the recent surge of stentriever implementation in the treatment of ischemic stroke, some operators are now using such devices in the retrieval of migrated coils. We present a case of a balloon-assisted coil embolization of a communicating segment internal carotid artery aneurysm, complicated by coil migration far distally into the middle cerebral artery, which was retrieved successfully with a stentriever. To the best of our knowledge, this is the furthest migration of a coil to be successfully retrieved with a stentriever. We review conservative and invasive management of displaced coils and the technical advantages of stentrievers over retrieval devices.**

METHODS: **The patient's medical records were retrospectively reviewed, including clinical and radiographic information. This study received institutional review board approval.**

RESULTS: **The patient was treated with balloon-assisted coil embolization of the internal carotid artery aneurysm. The migrated coil was retrieved successfully using a novel application of a stentriever.**

CONCLUSIONS: **In certain situations, a stentriever does not mandate complete ensnaring of the target to be retrieved and thus need not always be deployed distal to a migrated coil mass to be successful. Due to the mechanical advantage of strut-engagement, stentrievers can afford to be positioned in relatively suboptimal positions, and this is especially useful in cases involving tortuous and small distal vessels (<2 mm diameter).**

INTRODUCTION

Endovascular coil embolization for the treatment of intracranial aneurysms is a proven and widely accepted alternative to traditional microsurgical clipping. Procedural morbidity rates of 4%–6% and mortality rates of 1%–4% have been reported.[1] Although rare, displacement of endovascular coils into a parent artery during embolization is a potentially life-threatening complication. Although many cases of coil displacement can be managed conservatively, severe instances may require coil retrieval attempts. Several methods for coil retrieval have been described, including the use of endovascular snares and retrieval devices. With the recent surge of stentriever implementation in the treatment of ischemic stroke, some operators are now using such devices in the retrieval of migrated coils.

We present a case of a balloon-assisted coil embolization of a communicating segment internal carotid artery (ICA) aneurysm, complicated by a coil that displaced far distally into the M3 segment of the middle cerebral artery (MCA), which was successfully retrieved using a Solitaire stentriever (Covidien/

Key words
- Cerebral aneurysm
- Coil displacement
- Coil migration
- Embolization
- Endovascular
- Retrieval
- Stentriever

Abbreviations and Acronyms
ICA: Internal carotid artery
MCA: Middle cerebral artery

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Medtronic, Dublin, Ireland). To the best of our knowledge, this is the furthest migration of a coil to be successfully retrieved using a stentriever. We present this case to highlight the technical advantages of stentrievers over retrieval devices, especially when extracting foreign bodies from small, distal, and tortuous cerebrovascular anatomy. This case also shows that unlike snares and microforceps retrieval devices, stentrievers do not mandate complete ensnaring of the target to be retrieved, and thus they may be successful even despite suboptimal positioning.

MATERIALS AND METHODS

This study received institutional review board approval. A 65-year-old female patient with hypertension presented to our institution for workup of vertigo. Computed tomography angiogram of the brain and subsequent digital subtraction angiogram demonstrated a wide-necked multilobulated right ICA aneurysm at the communicating segment, measuring 8 mm × 5 mm (**Figure 1A–C**). She was treated with aspirin and Plavix (Bristol-Meyers Squibb, New York, New York, USA) for 5 days, in preparation for balloon-assisted coil embolization.

Through a 6-French ENVOY MPC guide catheter (Codman, Raynham, Massachusetts, USA), a 3-mm × 10-mm HyperGlide balloon (Medtronic, Irvine, California, USA) was positioned across the neck of the aneurysm. The patient was treated with intravenous heparin to maintain an activated clotting time of 2.5 times the baseline value during the procedure. Through an Excelsior SL-10 Microcatheter (Stryker, Fremont, California, USA), a 4-mm × 10-cm ORBIT GALAXY COMPLEX XTRASOFT microcoil (Codman, Raynham) was used to frame the aneurysm. This was followed by 2 additional 3-mm × 6-cm ORBIT GALAXY COMPLEX XTRASOFT coils (**Figure 1D**).

During each coil deployment, the HyperGlide balloon was inflated for approximately 2 minutes, then slowly deflated after coil insertion. Upon the fourth inflation for the final finishing coil, the previously placed coil herniated out of the aneurysmal sac and into the M1 segment of the MCA (**Figure 1E**). The herniated coil did not present a suitable edge for a microsnare target, and the M1 segment was not large enough to accommodate opening of a microforceps retrieval deice. A 0.014-inch microwire was tracked distal to the displaced coil. However, attempts to pass a Marksman Micro Catheter (Medtronic) distal to the bulk of the coil mass further displaced the coil into the M3 segment, with a portion trailing into the M1 segment (**Figure 1F**). Further attempts to navigate the microcatheter distal to the bulk of the coil mass were aborted, and the Marksman Micro Catheter was positioned proximal to the coil mass in the M2/M3 segment. A 6-mm × 30-mm Solitaire FR device was deployed in the M2 segment of the MCA (**Figure 1G**). Once the Solitaire device engaged the trailing coil wire, the Solitaire and the microcatheter were

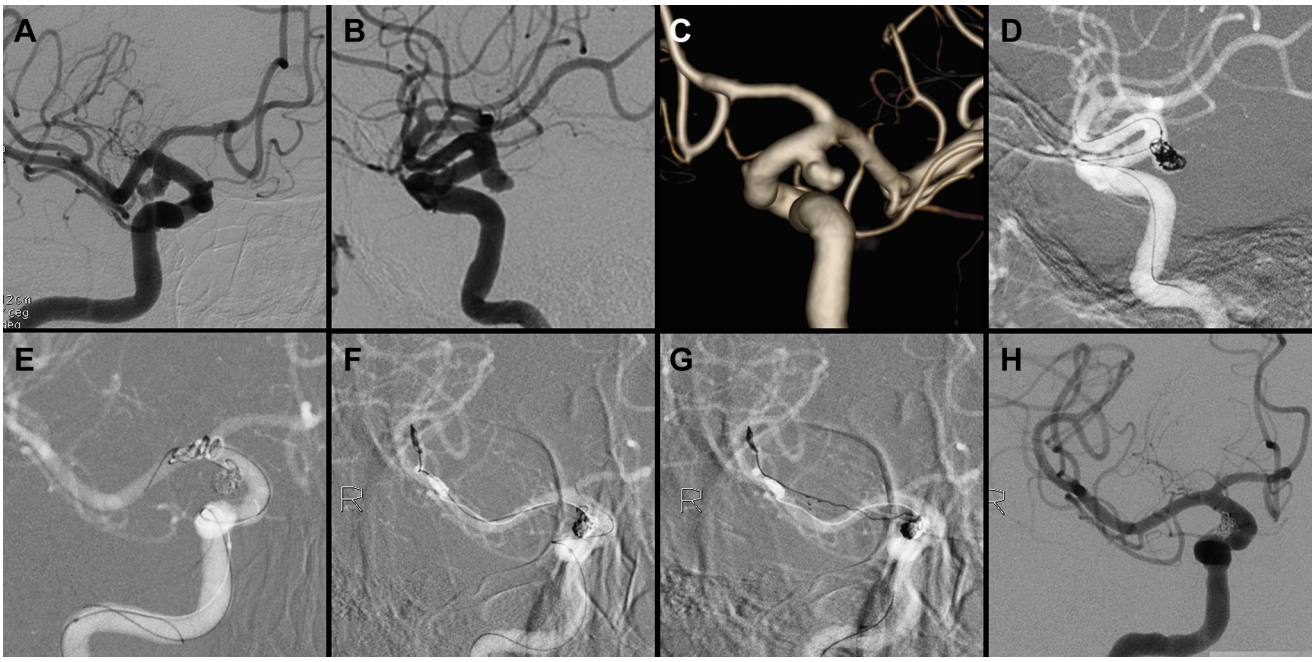

Figure 1. (**A–C**) Digital subtraction angiogram (DSA) with 3-dimensional volume-rendered reconstruction showing wide-necked multilobulated paraclinoid right internal carotid artery aneurysm at the communicating segment. (**D**) DSA with road-mapped image after deployment of third coil showing deflated HyperGlide balloon across aneurysm neck with moderate packing density. (**E**) Initial migration of the coil out of the aneurysmal sac and into the M1 segment of the middle cerebral artery (MCA). (**F**) Subsequent further migration of the coil into the M3 segment of the MCA after attempts to position a microcatheter distal to the migrated coil. (**G**) Deployment of Solitaire stentriever proximal to the bulk of the coil mass. (**H**) Unsubtracted DSA after coil retrieval showing moderate packing-density, without disruption of existing coil mass.