

# Retrieval of Distally Migrated Coils with Detachable Intracranial Stent during Coil Embolization of Cerebral Aneurysm

Devendra Pal Singh<sup>1</sup>, Soon Chan Kwon<sup>2</sup>, Lijin Huang<sup>3</sup>, Won Joo Lee<sup>2</sup>

<sup>1</sup>Department of Neurosurgery, SPS Apollo Hospital, Ludhiana, India

<sup>2</sup>Department of Neurosurgery, Ulsan University Hospital, University of Ulsan College of Medicine, Ulsan, Korea

<sup>3</sup>Department of Neurosurgery, The 3rd affiliated Hospital of Sothern Medical University, Guangzhou, China

Migration of coils during endovascular procedures is a rare, but well-known complication. We are reporting two cases of successfully retrieving migrated coil using detachable intracranial stent.

In both of our cases there was distal migration of coil during the intracranial aneurysm coiling procedure. The Solitaire<sup>®</sup> AB stent (Covidien, Irvine, CA, USA) was used to retrieve those coils. The stent was passed distal to the migrated coil using standard technique. It was then partially deployed and gradually withdrawn along with the entangled coil.

Coil retrieval using the fully retrievable intracranial stent is a very simple, safe and easily available alternative for retrieval of distally migrated coil.

**J Cerebrovasc Endovasc Neurosurg.**  
**2016 March;18(1):48-54**

Received : 19 January 2015

Revised : 12 August 2015

Accepted : 14 September 2015

**Correspondence to Soon Chan Kwon**

Department of Neurosurgery, Ulsan University Hospital, University of Ulsan College of Medicine, 877 Bangeojinsunhwan-doro, Dong-gu, Ulsan 44033, Korea

Tel : 82-52-250-7139

Fax : 82-52-250-7138

E-mail : nskwon.sc@gmail.com,

sckwon@uuh.ulsan.kr

ORCID : <http://orcid.org/0000-0003-4885-4156>

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Keywords** Endovascular procedure, Complication, Intracranial aneurysm, Stent

## INTRODUCTION

With the coming up of endovascular coiling as a standard therapy for treatment of cerebral aneurysms, complications that are related to it are also coming up. Distal migration of the coil is one of the serious complications. If not managed quickly, it can lead to thrombus formation and vessel occlusion resulting into cerebral infarction.

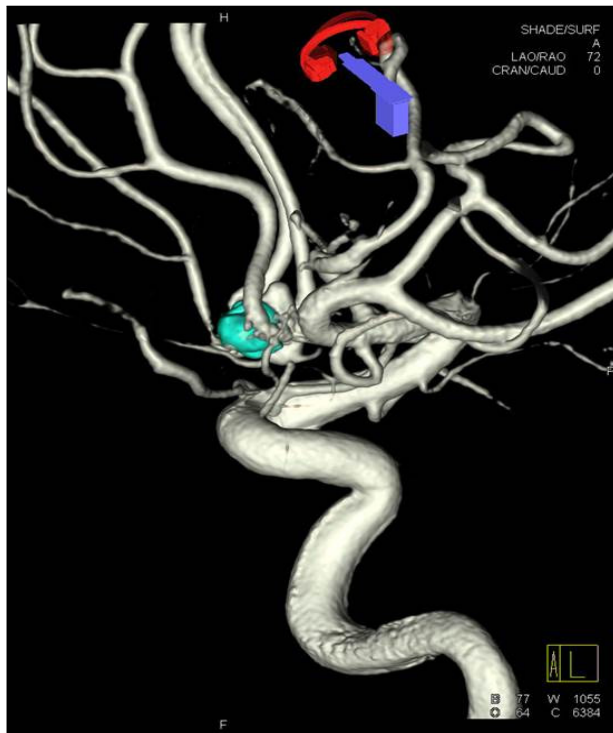
Various techniques have been described to address this complication, using variety of devices.<sup>1-12)14)16)17)19-21)</sup>

We describe here a technique that was used in two patients for retrieval of distally migrated coil using the Solitaire<sup>®</sup> AB stent.

## CASE REPORT 1

A 57-year-old woman underwent balloon assisted coil embolization, for ruptured anterior communicating (A-com.) aneurysm. Her angiogram one year later showed residual aneurysmal sac (Fig. 1).

Stent-assisted coiling of the remnant sac was planned (Fig. 2). 75 mg of clopidogrel and 100 mg of aspirin was given for 5 days before the procedure. During the procedure a coil (MicroPlex HyperSoft Helical 1.5 × 1 mm, Microvention, Tustin, CA, USA) migrated into the contralateral anterior cerebral artery (ACA) (Fig. 3). Initially it got lodged into the right A2 segment but it migrated further and finally it got lodged into the distal callosomarginal artery (Fig. 4),

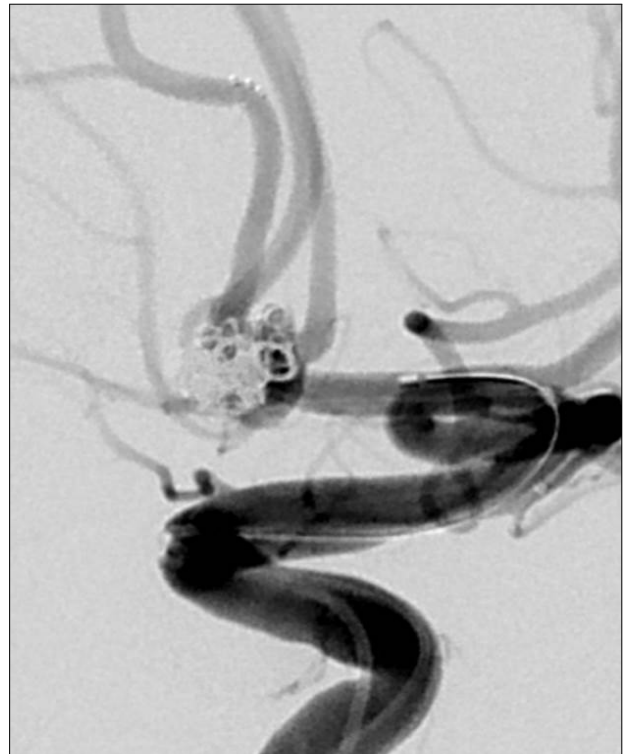


**Fig. 1.** One year, follow-up 3-dimensional cerebral angiography (showed trifurcation of A2 and residual aneurysmal sac of A-com aneurysm).

causing its occlusion. We removed undetached stent, and a microcatheter (Prowler Plus Select, Codman Neurovascular, Raynham, MA, USA), which was initially used for stent-assistance, was negotiated beyond the occluded ACA (Fig. 5), and Solitaire<sup>®</sup> AB 4 × 15 mm stent was passed through it distal to the occluded artery and was deployed (Fig. 6). It was then gradually withdrawn, entangling the migrated coil and was captured into the microcatheter. Microcatheter along with the stent was then withdrawn, retrieving the displaced coil along with it (Fig. 7).

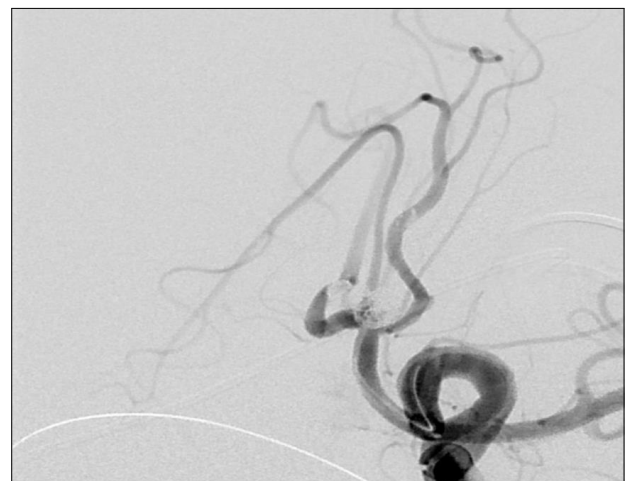
## CASE REPORT 2

A 44-year-old female presented with SAH, Hunt and Hess grade 2. Her cerebral angiogram showed the right posterior communicating (P-com.) artery aneurysm, sized 2.2 × 2.2 × 6.1 mm (Fig. 8). After placement of 3 coils, there was still some space remaining near the neck. A DeltaPlush (Codman Neurovascular,

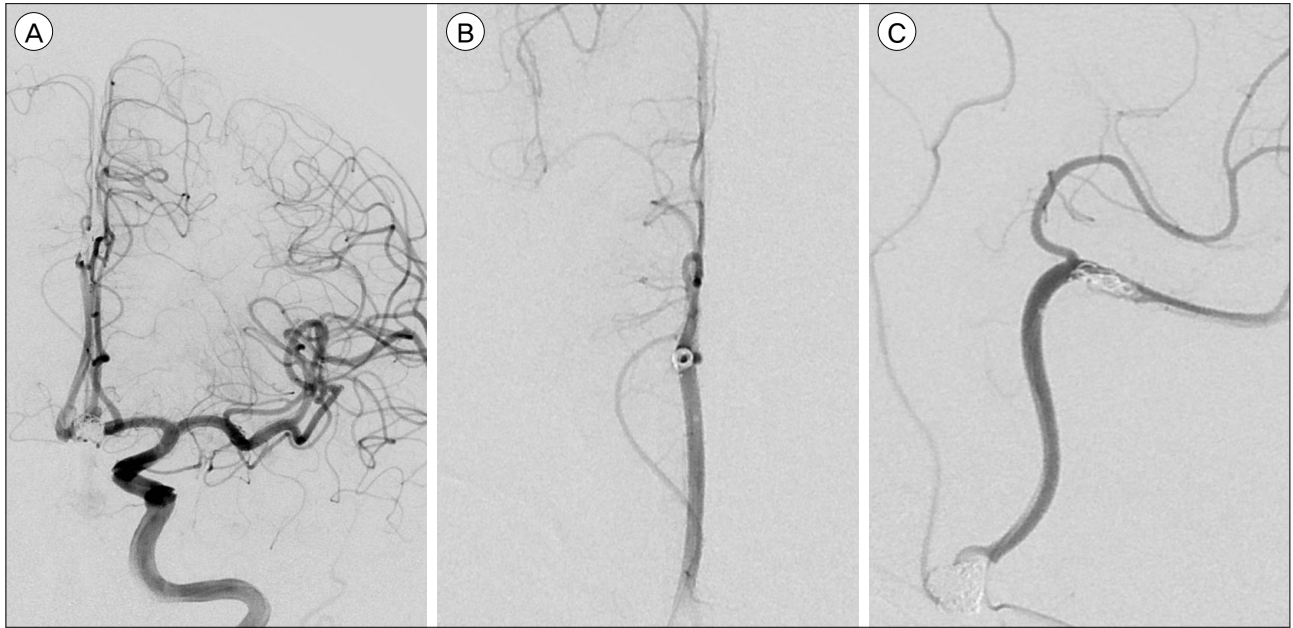


**Fig. 2.** Intra-operative angiography. A stent was placed around aneurysmal neck and further coil was placed in aneurysmal sac.

Raynham, MA, USA) 1.5 × 2 mm coil was used to pack the sac. After the coil was detached it got dislodged from the aneurysm and migrated into the right MCA branch (Fig. 9). A microcatheter (Rebar18, Covidien, Irvine, CA, USA) was passed beyond the embolic coil



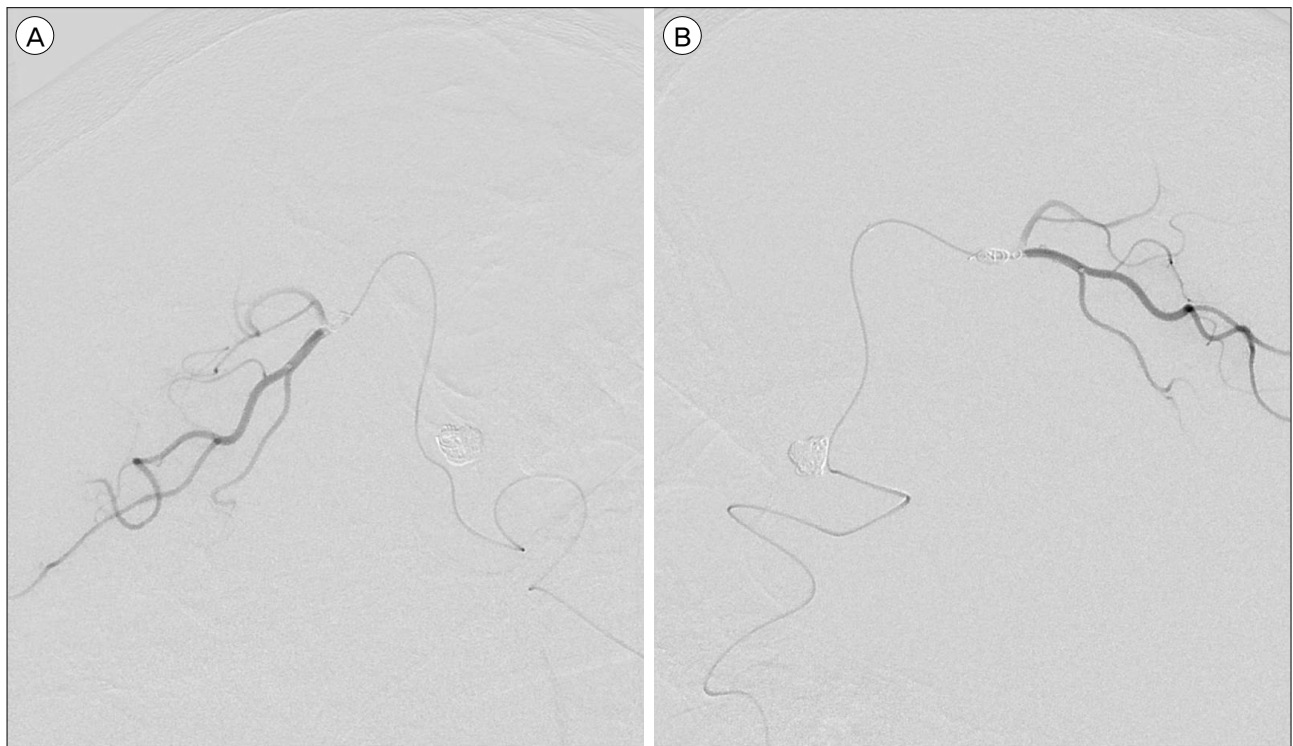
**Fig. 3.** Angiography showing the migrated filling coils to the proximal anterior cerebral artery.



**Fig. 4.** Cerebral angiography (A) and micro-angiography (B, C) showing further migration of coil into distal anterior cerebral artery.

and a 4 × 15 mm sized Solitaire® Stent was passed through it distal to the migrated coil. The stent was

then, successfully withdrawn along with the micro-catheter retrieving the entangled coil along with it



**Fig. 5.** Micro-angiography (A, B) showing distally navigated microcatheter beyond migrated coil.



**Fig. 6.** Roadmap images (A, B) showing deployed stent with entangled coil.

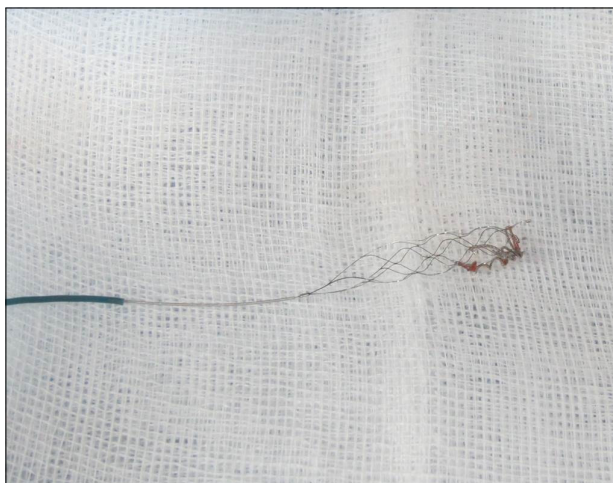
(Fig. 10, 11).

## DISCUSSION

Coil migration is a well-known complication associated with endovascular coiling. It can cause brain ischemia due to distal vessel occlusion. Factor that predispose to this complication are wide neck aneur-

ysms, small fundus to neck ratio, tortuous vessel, unstable microcatheter position, use of undersized coil, premature detachment and high flow conditions. Despite continual improvements in materials and techniques, the risk of coil misplacement or migration, even in the hands of experienced and skilled operators, remains.

Various strategies to remove displaced coils have

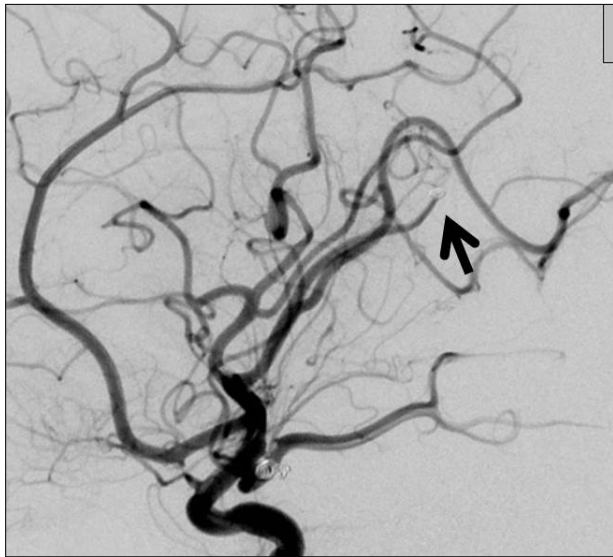


**Fig. 7.** Photograph showing the removed Solitaire stent with the coil.



**Fig. 8.** Initial cerebral angiography showing a right P-com. aneurysm.





**Fig. 9.** Angiography showing the migrated filling coils to the middle cerebral artery (arrow).

been reported,<sup>1-12)14)16)17)19-21)</sup> including surgery,<sup>15)18)</sup> but none of them appears easy and reliable.

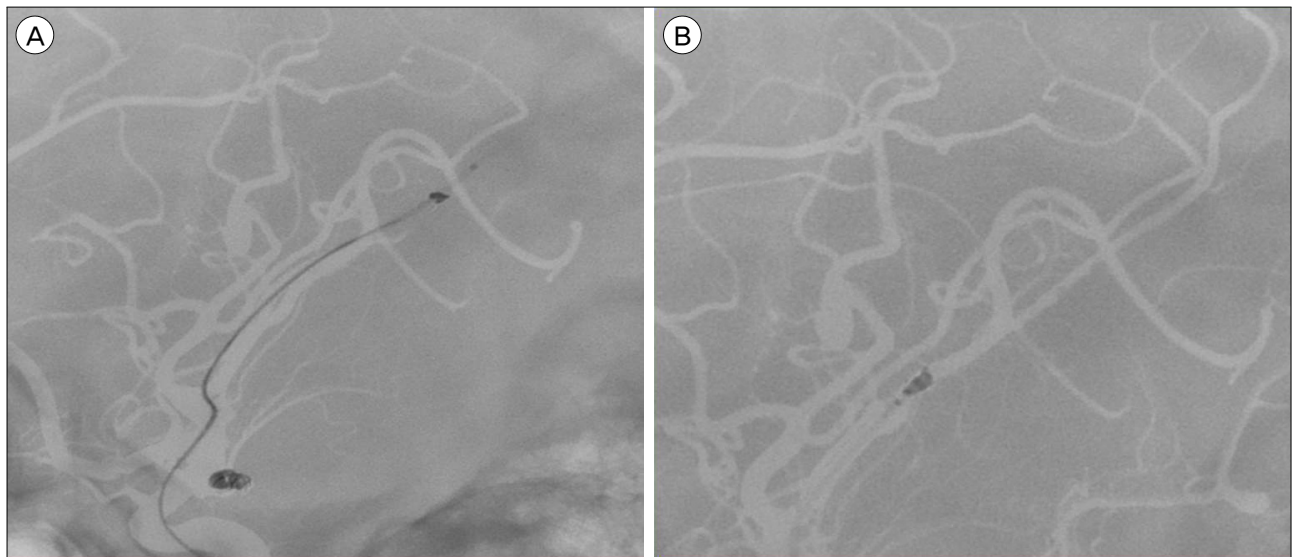
Already 2 cases of coil retrieval using a Solitaire® stent have been reported in the English literature.<sup>5)9)</sup>

In this case report, we have presented two cases in which there was an accidental coil migration during aneurysmal coiling. In both the cases Solitaire® AB stent was successfully used to retrieve the distally mi-

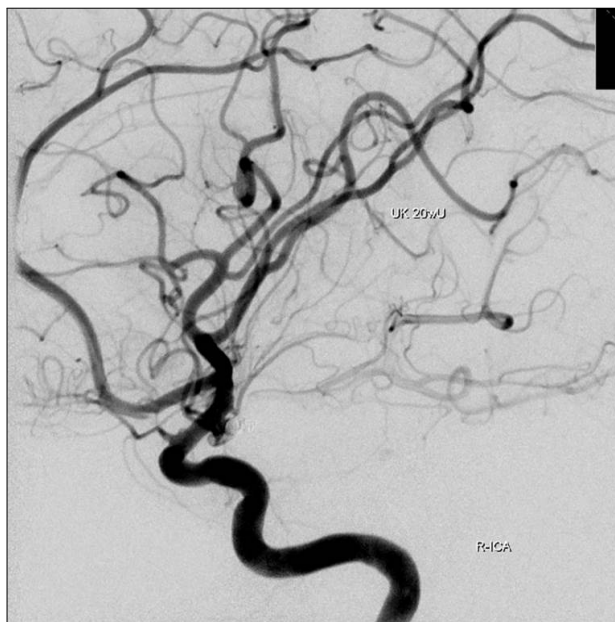
grated coil. The Stent was carried distal to the migrated coil and was expanded. The expanded stent was then gradually withdrawn, leading to the entangling of the migrated coil into the struts of the stent. The Stent was then withdrawn along with the migrated coil.

Initially the Solitaire® stent, which is a self-expanding and fully retrievable even after full deployment, was developed and designed as neurovascular reconstruction device for endovascular treatment of wide-necked and complex intracranial aneurysms. But, nowadays due to its peculiar structural design, it is also used for mechanical thrombectomy.<sup>13)</sup>

We found that the Solitaire® AB stent can be used to retrieve distally migrated coil in vessels of small diameter where the use of other devices can be dangerous or technically demanding. Owing to its Parametric™ design (an overlapping stent-based technology), its struts can overlap, at least partially, when the stent is compressed. These overlapping struts allow the stent to be crimped to a smaller initial delivery diameter than may be achieved with non-overlapping designs for given metal density. This reduces the delivery diameter which allows the stent to be placed in the distal small tortuous vessels and thus it can be safely



**Fig. 10.** Roadmap images (A, B) showing distally navigated microcatheter beyond migrated coil and deployed stent with coil.



**Fig. 11.** The final angiogram showing totally occluded aneurysm and with well-preserved distal middle cerebral artery flows.

used to retrieve coils that have migrated to distal vessels, which may not be possible with other alternatives.

Problems that have been associated with coil retrieval devices are lack of universal availability, complications associated with them, and most importantly, because they are very infrequently used, they could be difficult to handle.

Micro-snare and Merci Retriever (Stryker; Kalamazoo, MI, USA), especially when used in small diameter vessels can cause vessel wall injury,<sup>3)4)16)</sup> Although we have used Solitaire<sup>®</sup> stent for coil retrieval in only two cases we did not face any problem using it. But we think that the complications that could be associated with it would not be different from those that are encountered, when it is used for mechanical thrombolysis and there, it has been found to be having low complication rate.

Because of its frequent uses, such as vascular reconstruction for aneurysm coiling and mechanical thrombectomy, Solitaire<sup>®</sup> stent is readily available is easy to handle as compared to other devices.

Although using a Solitaire<sup>®</sup> stent for retrieval of distally migrated coils is off-label use, the technique with

a Solitaire<sup>®</sup> stent provides us a simple and safe method to retrieve the distally migrated coil, especially for the coils that get lodged in distal small vessels. It has one more advantage of universal availability. Therefore, it could be considered as an option for removing migrated coils.

## CONCLUSION

Retrieval of migrated coil using Solitaire<sup>®</sup> AB stent is a safe, simple and effective technique in selected cases. And can be considered as an option for coils that have migrated distally.

## Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

## REFERENCES

1. Cekirge S, Saatci I, Firat MM, Balkanci F. Retrieval of an embolization coil from the internal carotid artery using the Amplatz microsnare retrieval system. *Cardiovasc Intervent Radiol.* 1995 Jul-Aug;18(4):262-4.
2. Fiorella D, Albuquerque FC, Deshmukh VR, McDougall CG. Monorail snare technique for the recovery of stretched platinum coils: technical case report. *Neurosurgery.* 2005;57(1 Suppl):E210; discussion E210.
3. Graves VB, Rappe AH, Smith TP, Sepetka I, Ahuja A, Strother CM. An endovascular retrieving device for use in small vessels. *AJNR Am J Neuroradiol.* 1993 Jul-Aug;14(4):804-8.
4. Henkes H, Lowens S, Preiss H, Reinartz J, Miloslavski E, Kuhne D. A new device for endovascular coil retrieval from intracranial vessels: alligator retrieval device. *AJNR Am J Neuroradiol.* 2006 Feb;27(2):327-9.
5. Hopf-Jensen S, Hensler HM, Preiß M, Müller-Hülsbeck S. Solitaire<sup>®</sup> stent for endovascular coil retrieval. *J Clin Neurosci.* 2013 Jun;20(6):884-6.
6. Koseoglu K, Parildar M, Oran I, Memis A. Retrieval of intravascular foreign bodies with goose neck snare. *Eur J Radiol.* 2004 Mar;49(3):281-5.
7. Lee CY. Use of wire as a snare for endovascular retrieval of displaced or stretched coils: rescue from a technical complication. *Neuroradiology.* 2011 Jan;53(1):31-5.
8. Liu KC, Ding D, Starke RM, Geraghty SR, Jensen ME. Intraoperative retrieval of migrated coils during endovascular aneurysm treatment with the Trevo Stentriever device. *J Clin Neurosci.* 2014 Mar;21(3):503-6.

9. O'Hare AM, Rogopoulos AM, Stracke PC, Chapot RG. Retrieval of displaced coil using a Solitaire® stent. *Clin Neuroradiol*. 2010 Dec;20(4):251-4.
10. Oh J, Kim J, Hong S, Hu C, Pyen J, Whang K, et al. Retrieval of unintended migrated detached coil: case report. *J Cerebrovasc Endovasc Neurosurg*. 2014 Sep;16(3):268-74.
11. Prestigiacomo CJ, Fidlow K, Pile-Spellman J. Retrieval of a fractured Guglielmi detachable coil with use of the Goose Neck snare "twist" technique. *J Vasc Interv Radiol*. 1999 Oct;10(9):1243-7.
12. Raftopoulos C, Goffette P, Billa RF, Mathurin P. Transvascular coil hooking procedure to retrieve an unraveled Guglielmi detachable coil: technical note. *Neurosurgery*. 2002 Apr;50(4):912-4; discussion 914-5.
13. Saver JL, Jahan R, Levy EI, Jovin TG, Baxter B, Nogueira R, et al. SOLITAIRE™ with the intention for thrombectomy (SWIFT) trial: design of a randomized, controlled, multicenter study comparing the SOLITAIRE™ Flow Restoration device and the MERCI Retriever in acute ischaemic stroke. *Int J Stroke*. 2014 Jul;9(5):658-68.
14. Schütz A, Solymosi L, Vince GH, Bendszus M. Proximal stent fixation of fractured coils: technical note. *Neuroradiology*. 2005 Nov;47(11):874-8.
15. Shin YS, Lee KC, Kim DI, Lee KS, Huh SK. Emergency surgical recanalisation of A1 segment occluded by a Guglielmi detachable coil. *J Clin Neurosci*. 2000 May;7(3):259-62.
16. Smith TP, Graves VB, Halbach VV, Higashida RT, Fraser KW, Dowd CF, et al. Microcatheter retrieval device for intravascular foreign body removal. *AJNR Am J Neuroradiol*. 1993 Jul-Aug;14(4):809-11.
17. Standard SC, Chavis TD, Wakhloo AK, Ahuja A, Guterman LR, Hopkins LN. Retrieval of a Guglielmi detachable coil after unraveling and fracture: case report and experimental results. *Neurosurgery*. 1994 Nov;35(5):994-8; discussion 999.
18. Thornton J, Dovey Z, Alazzaz A, Misra M, Aletich VA, Debrun GM, et al. Surgery following endovascular coiling of intracranial aneurysms. *Surg Neurol*. 2000 Nov;54(5):352-60.
19. Vora N, Thomas A, Germanwala A, Jovin T, Horowitz M. Retrieval of a displaced detachable coil and intracranial stent with an L5 Merci Retriever during endovascular embolization of an intracranial aneurysm. *J Neuroimaging*. 2008 Jan;18(1):81-4.
20. Watanabe A, Hirano K, Mizukawa K, Kamada M, Okamura H, Suzuki Y, et al. Retrieval of a migrated detachable coil—case report. *Neurol Med Chir (Tokyo)*. 1995 Apr;35(4):247-50.
21. Zoarski GH, Bear HM, Clouston JC, Ragheb J. Endovascular extraction of malpositioned fibered platinum microcoils from the aneurysm sac during endovascular therapy. *AJNR Am J Neuroradiol*. 1997 Apr;18(4):691-5.