The Growing Utility of Embolization

Using the Concerto™ 3D detachable coil system in challenging anatomies.

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Not long after the Swedish interventional radiology pioneer, Dr. Sven Ivar Seldinger (1921–1998) was, as he described in April 1952, struck by "a severe attack of common sense" on how the needle, guidewire, and catheter could be used together, the Seldinger method[1] was spread worldwide, contributing to tremendous development in endovascular treatments.

In the 1970s, coils were introduced to interventional radiology equipment, and the advent of embolotherapy has since improved endovascular treatment of vascular diseases. A range of materials is now being used for embolization, including gelfoam, liquid agents, particles, and coils. Some of these provide temporary occlusion, while others are used for permanent occlusion.

Clinical use for embolization might include treatment of arterial hemorrhage,[2] type II endoleak after endovascular aneurysm repair,* occlusion of aneurysms,[3] and various other vascular pathologies, such as pelvic congestion syndrome, varicoceles,[4] vascular malformations, and arteriovenous fistulas. Although traditional pushable coils have been shown to be effective, lesions are sometimes most effectively treated with detachable coils. Pushable coils have limitations, including difficulty in precise deployment with potential of incomplete occlusion, and above all, the risk of non-target embolization. Because of these shortcomings, pushable coils are in many situations being replaced with detachable coils, which offer better coil control and stability, as well as precise and safe deployment.

THE CONCERTO™ DETACHABLE COIL SYSTEM

The Concerto™ coil (Medtronic) provides good packing and occlusion. The nylon and PGLA filaments added to bare platinum coils increase thrombogenicity of coils, resulting in a much higher occlusion rate compared to bare platinum coils.[5] The handheld instant detacher is mechanical and easy to use with fully controlled delivery and safe coil detachment.

This ability provides great benefits in clinical practice, especially when dealing with high-flow vascular beds and difficult anatomies.

As observed in clinical practice, Concerto™ Helix coils are very soft and have excellent distal performance, which enables easy loop formation. In addition, new Concerto™ 3D coils (Figure 1) meet physicians' need to create a complex shape. The Concerto™ 3D coils, designed with a smaller first loop, promote optimal anchoring, more accurate placement in high-flow scenarios, and excellent scaffolding. The Concerto™ 3D coil is used to form a frame; it folds into a dense and knotty shape, which helps to fill in an aneurysm using the Russian doll technique, similar to the way neurovascular aneurysms are treated. This conformable shape is also helpful for achieving a focal occlusion with an excellent anchor during vessel take-down with an easy loop formation and scaffold forming.

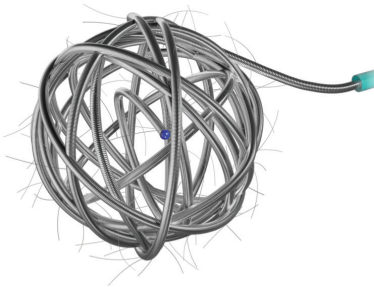

Figure 1. The Concerto™ 3D detachable coil system.

Concerto™ 3D coils can be used in conjunction with Medtronic's Concerto™ Helix device using the same delivery and detachment systems. The Concerto™ Helix and 3D coil systems come in a wide range of sizes and lengths for controlled embolization of many different arterial and venous vascular beds.

It is important to use an appropriately sized microcatheter to avoid packing of the coil inside the microcatheter. The recommended microcatheter for 2- to 4-mm Concerto™ Helix coils and for 2- to 10-mm Concerto™ 3D coils is 0.0165 inches. This size gives interventionalists the opportunity to treat more distally and to treat smaller vessels with coils. The recommended microcatheter size for 5- to 20-mm Concerto™ Helix and 12- to 18-mm Concerto™ 3D coils is 0.021 inches.

DISCUSSION

As studies have demonstrated, the density of coil packing is critical for providing effective and long-term occlusion within intracranial aneurysms.[6] The adoption

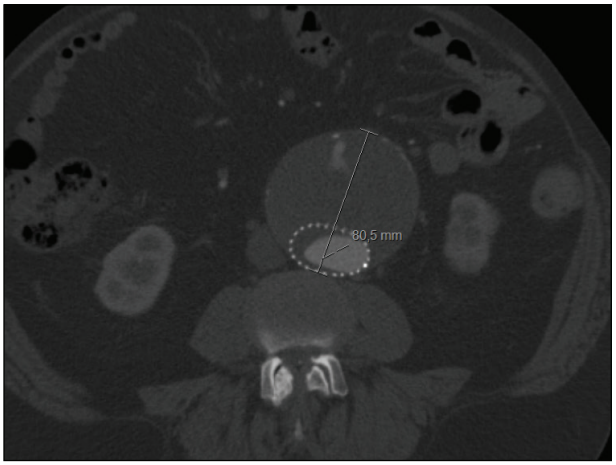

Figure 2. CTA of the Case 1 patient showing the infrarenal abdominal aneurysm after endovascular aneurysm repair. The diameter of the aneurysm was 80 mm, and there was a type II endoleak through the IMA and the arc of Riolan. Individual results may vary.

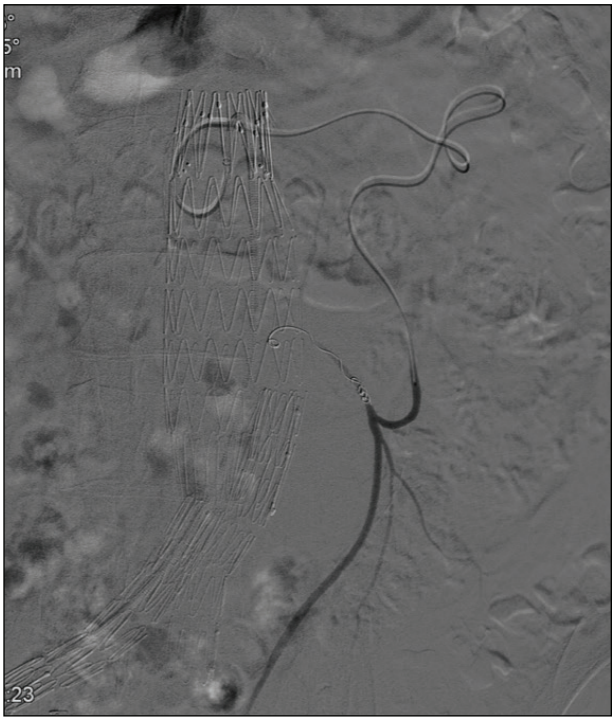

Figure 3. Angiogram from the Case 1 patient after treatment of the type II endoleak through the IMA and arc of Riolan with a Concerto™ Helix detachable coil. Individual results may vary.

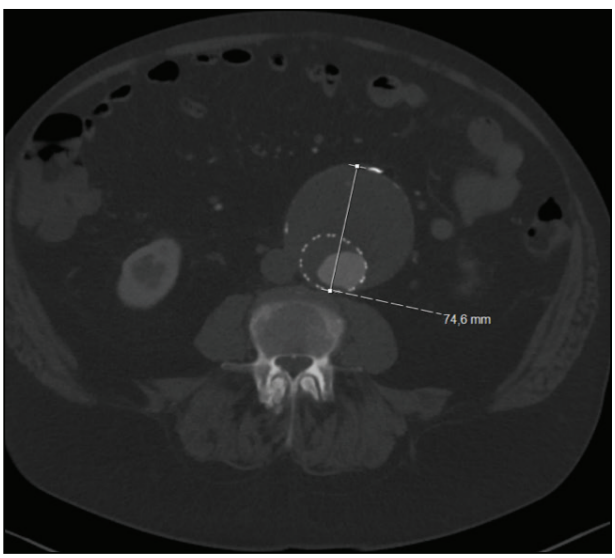

Figure 4. CTA from the Case 1 patient 5 years after treatment of the type II endoleak with a Concerto™ Helix detachable coil, now with decreased aneurysm diameter and no further endoleak. Individual results may vary.

of neurovascular embolization techniques regarding coil packing density within the peripheral vascular space leads physicians to utilize coils that can create optimal coil packing. The distal deliverability and softness of the Concerto™ Helix coil in addition to the complex configuration of Concerto™ 3D allow physicians to create a tight coil pack with the ability to reposition for accurate deployment before detachment.

The aim of this article is to discuss two of the current Concerto™ coils—Helix and 3D—and what additional advantages the new 3D coils system might provide to the embolization procedure.

CASE 1: THE CONCERTO™ HELIX COIL

A 75-year-old man was treated in 2006 for an asymptomatic infrarenal aneurysm with a bifurcated stent graft (Cook Zenith Flex™ AAA Endovascular Graft). A type II endoleak was present on the post-EVAR angiogram. During yearly repeated follow-up CT scans, the aneurysm size was shown to increase, and 6 years after the index procedure, it had reached the diameter of 80 mm (Figure 2). He underwent endovascular treatment of the type II endoleak in 2012. The superior mesenteric artery was selectively catheterized with a 5-F Sidewinder 1 catheter™ (AngioDynamics), and a 6-F Flexor™ Ansel sheath (Cook Medical) was placed in the proximal superior mesenteric artery over a Glidewire Advantage™ 35 (Terumo Interventional Systems). Superselective catheterization of the endoleak in the aneurysm sac through the arc of Riolan was performed with a Progreat™ 2.0 (Terumo Interventional Systems). A Concerto™ Helix detachable coil was intended to be placed in the proximal part of the inferior mesenteric artery (IMA). The distal end of the Concerto™ Helix coil did not form a loop due to the high flow of the IMA. This did not create any clinical problem, but the elongated part of the coil did not effectively contribute to the packing and vessel occlu-

Figure 5. Angiogram from the Case 2 patient showing a pseudoaneurysm on the left uterine artery. Individual results may vary.

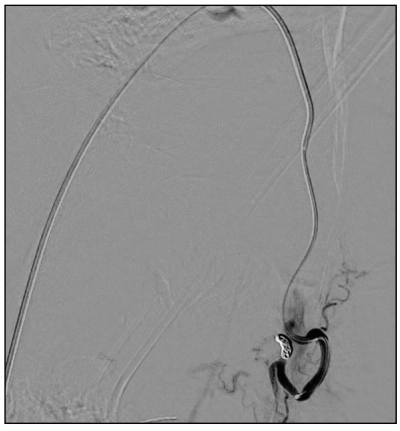

Figure 6. Angiogram from the Case 2 patient after occlusion of the left-sided pseudoaneurysm with Concerto™ 3D coil. Individual results may vary.

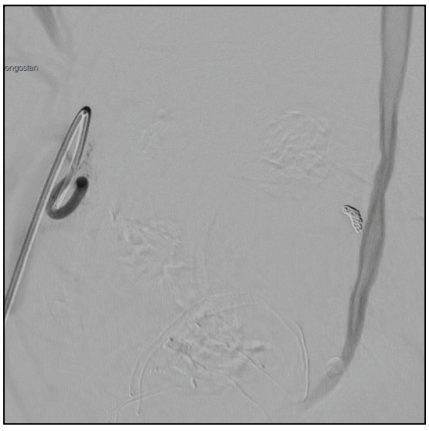

Figure 7. Angiogram from the Case 2 patient after temporary occlusion of the right uterine artery with gelfoam. Individual results may vary.

sion. A complex coil shape, such as the Concerto™ 3D coil, may be better suited for high-flow vessel dynamics to secure optimal anchoring due to the smaller first loop of the coil.

The proximal part of the coil was accurately deployed in the IMA, before the bifurcation of the IMA/arc of Riolan (Figure 3). This delicate coil placement could safely be performed due to the precise delivery and detachment system. Follow-up CT scans, now at 5 years after the intervention, have shown exclusion of the endoleak and reduced aneurysm diameter (Figure 4).

CASE 2: THE CONCERTO™ 3D COIL

A 32-year-old woman delivered her first child by cesarean section. During delivery, she bled 3 L, but she was discharged 10 days later with a healthy child. Six weeks after delivery, she was hospitalized again with bleeding that was not possible to control through vaginal packing and compression in the operating room. After a thorough discussion, she was transferred to the hybrid interventional radiology suite to stop the bleeding with embolization.

Angiography showed a pseudoaneurysm on the left uterine artery (Figure 5). After catheterization of the left hypogastric artery with a Cobra-shaped Glidecath™ hydrophilic catheter (Terumo Interventional Systems), superselective catheterization of the left uterine artery was performed. The distal left uterine artery was embolized with a 3-mm X 6-cm Concerto™ 3D coil (Figure 6) and the right uterine artery was temporarily embolized with gelfoam (Spongostan™, Ethicon; Figure 7). The Concerto™ 3D coil could easily form a loop in the left uterine artery, and dense packing could be performed. The patient was directly stabilized and the bleeding stopped. She was discharged from the hospital after 2 days and has not had any further gynecologic bleeding or disease.

CONCLUSION

The field of embolization therapy has grown in the past 3 decades as the role of devascularization has expanded, and the embolization technologies available have increased to include gelfoam, liquid agents, particles, and coils. The Concerto™ coil, available in a wide range of sizes and lengths, makes it easy to achieve a precise delivery. Its controlled deployment and detachment mechanism represents a significant advancement in embolotherapy. The ability to place and, if needed, reposition the coil without any time constraint is a huge benefit in clinical practice, which will help provide good long-term results without treatment failures. ■

*Concerto™ coils are indicated for use in the peripheral vasculature, which may include endoleak feeder vessels; consult local regulations and Instruction for Use.

1. Seldinger SI. Catheter replacement of the needle in percutaneous arteriography; a new technique. Acta radiol. 1953;39:368-376.
2. Nicholson AA, Ettles DF, Hartley JE, et al. Transcatheter coil embolectomy: a safe and effective option for major colonic haemorrhage. Gut. 1998;43:79-84.
3. Gandras EJ, Greben CR, Putterman D, et al. Visceral arterial embolization. Endovasc Today. 2008;6:66-74.
4. White RI Jr. Interventional radiology: reflections and expectations. The 1985 Eugene P. Pendergrass new horizons lecture. Radiology. 1987;162:593-600.
5. Girdhar G, Read M, Sohn J, et al. In-vitro thrombogenicity assessment of polymer filament modified and native platinum embolic coils. J Neurol Sci. 2014;339:97-101.
6. Gaba RC, Ansari SA, Roy SS, et al. Embolization of intracranial aneurysms with hydrogel-coated coils versus inert platinum coils: effects on packing density, coil length and quantity, procedure performance, cost, length of hospital stay, and durability of therapy. Stroke. 2006;37:1443-1450.

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