

# Hydrogel coated coil

Results suggest that endovascular coil embolization with second-generation hydrogel coils may reduce the rate of unfavorable outcome events in patients with small- and medium-sized intracranial aneurysms <sup>1)</sup>.

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Bioactive coils were introduced in 2002 in an attempt to improve aneurysm healing and durability of angiographic results. Evidence demonstrating superior efficacy to justify the routine use of bioactive coils over bare coils is limited.

Broeders et al. compared the periprocedural and clinical outcome after bioactive and bare platinum coiling for intracranial aneurysms.

MEDLINE, EMBASE, Cochrane Library, and ISI Web of Knowledge Conference Proceedings Citation Index-Science were searched for randomized clinical trials (RCTs) comparing bioactive and bare coils. The methodological quality was evaluated to assess bias risk. Periprocedural outcomes and mid-term outcomes were compared.

Five independent RCTs comparing bioactive (n=1084) and bare coils (n=1084) were identified. Periprocedural outcome was similar for both groups. Bioactive coiling increased the rate of complete aneurysm occlusion (47% vs 40%; RR 1.17 (95% CI 1.05 to 1.31); p=0.006) and reduced the rate of residual aneurysm neck at 10 months compared with bare coiling in the mid-term (26% vs 31%; RR 0.82 (95% CI 0.70 to 0.96); p=0.01). There were no differences in aneurysm recurrence, aneurysm rupture, stroke, neurological death, modified Rankin Scale score and reinterventions. Subgroup analysis for the three RCTs on hydrogel coils demonstrated reduction of residual aneurysms compared with bare coiling (25% vs 34%; RR 0.76 (95% CI 0.58 to 0.99); p=0.04).

Bioactive coils ensure a higher rate of medium-term complete aneurysm occlusion while reducing the rate of residual neck aneurysms compared with bare coiling in the mid-term. Hydrogel coils reduce residual aneurysms compared with bare coils. While there is level 1a evidence to show more complete aneurysm occlusion, longer term follow-up is needed to determine if this translates into clinical significance <sup>2)</sup>.

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In 2011, the Hydrogel-Coated Coils Versus Bare Platinum Coils for the Endovascular Treatment of Intracranial Aneurysms trial studied first-generation hydrogel coils and found some evidence of benefit of hydrogel over standard, platinum coils <sup>3)</sup>.

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The hydrogel-coated platinum coil consisting of carrier platinum coil coupled with an expansile hydrogel material, undergoes a nine fold increase in volume when placed into a physiological environment <sup>4)</sup>.

They cause more tissue reaction and organization compared with bare platinum coils, possibly attributed to observed elastic lamina damage and vascular smooth muscle cell proliferation <sup>5)</sup>.

Hydrogel coated **coils** lowers major aneurysm recurrence.

The hydrogel-coated coils versus bare platinum coils for the endovascular treatment of intracranial aneurysms (HELPS) trial reported a major angiographically confirmed recurrence in 24%-33% of patients at the 18-month follow-up in a per-protocol analysis <sup>6)</sup>.

Compared to bare platinum coils (BPC) required less total number of coils to provide a denser aneurysm filling. However, there were equivocal results with both devices, at the mid-term angiographic follow-up <sup>7)</sup>.

Hydrogel-coated coils exhibit significantly less stiffness due to the mechanical properties of the hydrogel and the inhibition of fibrin network formation by the hydrogel <sup>8)</sup>.

Aneurysms 3 mm in diameter or smaller can be coiled safely with the use of both bare platinum and hydrogel-coated coils. In most cases, coiling of small aneurysms can be performed without the use of adjunctive devices such as balloons or stents <sup>9)</sup>.

Self-expandable hydrogel-coated coils were developed to reduce recanalization rates of cerebral aneurysms by promoting complete volumetric aneurysm occlusion.

Furuichi et al. report a case of brainstem hemorrhage following coil embolization of a large basilar aneurysm with hydrogel-coated coils.

A 65-year-old female with a history of hypertension, who presented with worsening headaches, right hemiplegia, and left oculomotor palsy, underwent endovascular treatment for a large basilar aneurysm. The aneurysm was treated with both hydrogel-coated coils and bare platinum coils. Hydrogel-coated coils represented 46% of the coil length in the aneurysm. The patient was discharged from the hospital with improvement of neurological deficits 6 days after the procedure. However, the patient was readmitted with perianeurysmal edema in the midbrain 23 days after coil embolization. Follow-up angiography 26 days after the procedure showed complete obliteration of the aneurysm. Two weeks later, the patient presented with a large brainstem hemorrhage and died. Pathological findings revealed intraparenchymal hemorrhage in the pons without rupture of the aneurysm.

Hydrogel-coated coils may cause a marked inflammatory response that may result in intracerebral hemorrhage <sup>10)</sup>.

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Taschner CA, Chapot R, Costalat V, Machi P, Courthéoux P, Barreau X, Berge J, Pierot L, Kadziolka K, Jean B, Blanc R, Biondi A, Brunel H, Gallas S, Berlis A, Herbreteau D, Berkefeld J, Urbach H, Elsheikh S, Fiehler J, Desal H, Graf E, Bonafé A. Second-Generation Hydrogel Coils for the Endovascular Treatment of Intracranial Aneurysms: A Randomized Controlled Trial. *Stroke*. 2018 Mar;49(3):667-674. doi: 10.1161/STROKEAHA.117.018707. Epub 2018 Feb 6. PubMed PMID: 29437981; PubMed Central PMCID: PMC5839703.

2)

Broeders JA, Ahmed Ali U, Molyneux AJ, Poncyljusz W, Raymond J, White PM, Steinfert B. Bioactive versus bare platinum coils for the endovascular treatment of intracranial aneurysms: systematic review and meta-analysis of randomized clinical trials. *J Neurointerv Surg*. 2016 Sep;8(9):898-908. doi: 10.1136/neurintsurg-2015-011881. Epub 2015 Sep 10. Review. PubMed PMID: 26359214.

3)

White PM, Lewis SC, Gholkar A, et al. Hydrogel-coated coils versus bare platinum coils for the endovascular treatment of intracranial aneurysms (HELPS): a randomised controlled trial. *Lancet*. 2011;377(9778):1655-1662.

4)

Kallmes DF, Fujiwara NH. New expandable hydrogel-platinum coil hybrid device for aneurysm embolization. *Am J Neuroradiol*. 2002;23:1580–1588.

5)

Zhang C, Chaudhary N, Gemmete JJ, Thompson BG, Xi G, Pandey AS. Reactive tissue proliferation and damage of elastic lamina caused by hydrogel coated coils in experimental rat aneurysms. *J Neurointerv Surg*. 2014 Jul;6(6):480-6. doi: 10.1136/neurintsurg-2013-010867. Epub 2013 Sep 25. PubMed PMID: 24068780.

6)

White PM, Lewis SC, Gholkar A, Sellar RJ, Nahser H, Cognard C, Forrester L, Wardlaw JM; HELPS trial collaborators. Hydrogel-coated coils versus bare platinum coils for the endovascular treatment of intracranial aneurysms (HELPS): a randomised controlled trial. *Lancet*. 2011 May 14;377(9778):1655-62. doi: 10.1016/S0140-6736(11)60408-X. PubMed PMID: 21571149.

7)

Poncyłjusz W, Zarzycki A, Zwarzany L, Burke TH. Bare platinum coils vs. HydroCoil in the treatment of unruptured intracranial aneurysms-A single center randomized controlled study. *Eur J Radiol*. 2014 Nov 13. pii: S0720-048X(14)00508-7. doi: 10.1016/j.ejrad.2014.11.002. [Epub ahead of print] PubMed PMID: 25480678.

8)

Haworth KJ, Weidner CR, Abruzzo TA, Shearn JT, Holland CK. Mechanical properties and fibrin characteristics of endovascular coil-clot complexes: relevance to endovascular cerebral aneurysm repair paradigms. *J Neurointerv Surg*. 2015 Apr;7(4):291-6. doi: 10.1136/neurintsurg-2013-011076. Epub 2014 Mar 25. PubMed PMID: 24668257; PubMed Central PMCID: PMC4478590.

9)

Dalfino J, Nair AK, Drazin D, Gifford E, Moores N, Boulos AS. Strategies and outcomes for coiling very small aneurysms. *World Neurosurg*. 2014 May-Jun;81(5-6):765-72. doi: 10.1016/j.wneu.2013.01.090. Epub 2013 Jan 28. PubMed PMID: 23369937.

10)

Furuichi M, Shimoda K, Kano T, Satoh S, Yoshino A. [A Case of Brainstem Hemorrhage Following Embolization of a Large Basilar Aneurysm with Hydrogel-Coated Coils]. *No Shinkei Geka*. 2015 Sep;43(9):835-42. doi: 10.11477/mf.1436203130. Japanese. PubMed PMID: 26321698.

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