

Flow diverter for ruptured intracranial aneurysm

Although not recommended as a first-line treatment, the use of [flow diverters](#) to treat [ruptured intracranial aneurysms](#) may allow high rates of angiographic occlusion and good clinical outcome in carefully selected patients. Aneurysm size contributes to treatment risk because the rerupture rate following treatment is higher for aneurysms larger than 2 cm.

Systematic reviews

2016

A [systematic review](#) of Ovid MEDLINE, PubMed, Cochrane databases, and EMBASE from inception to December 2015 for articles that included ruptured aneurysms treated with flow diversion.

One hundred seventy-two records were screened, of which 20 articles contained sufficient patient and outcome data for inclusion.

Clinical and radiologic characteristics, procedural details, and outcomes were extracted from these reports. Aggregated occlusion rates and clinical outcomes were analyzed by using the Fisher exact test (statistical significance, $\alpha = .05$).

Complete occlusion of the aneurysm was achieved in 90% of patients, and favorable clinical outcome was attained in 81%. Aneurysm size greater than 7 mm was associated with less favorable clinical outcomes ($P = .027$). Aneurysm size greater than 2 cm was associated with a greater risk of rerupture after treatment ($P < .001$) ¹.

Case series

2016

This case series includes patients from 2 institutions. All patients underwent standard endovascular coiling in the acute phase after SAH with the intention and plan to proceed with flow diversion at a later date. Outcomes studied included angiographic occlusion, procedure-related complications, and long-term clinical outcome as measured using the modified Rankin Scale.

A total of 31 patients underwent coiling in the acute phase with the intention to undergo flow diversion at a later date. The mean aneurysm size was 15.8 ± 7.9 mm. Of the 31 patients undergoing coiling, 4 patients could not undergo further flow-diverter therapy: 3 patients (9.7%) died of complications of subarachnoid hemorrhage and 1 patient had permanent morbidity as a result of perioperative ischemic stroke (3.1%). Twenty-seven patients underwent staged placement of flow diverters after adequate recovery. The median time to treatment was 16 weeks. There was one case of aneurysm rebleeding following coil treatment. There were no cases of permanent morbidity or mortality resulting from flow-diverter treatment. Twenty-four patients underwent imaging follow-up; 18 of these patients had aneurysms that were completely or nearly completely occluded (58.1% on an intent-to-treat basis). At last follow-up (mean 18.3 months), 25 patients had mRS scores ≤ 2 (80.6% on an intent-to-treat basis).

Staged treatment of ruptured complex and giant intracranial aneurysms with coiling in the acute phase and flow-diverter treatment following recovery from SAH is both safe and effective. In this series, no cases of rebleeding occurred during the interval between coiling and flow diversion. This strategy should be considered as a valid option in patients presenting with these challenging ruptured aneurysms ²⁾.

2014

A retrospective study was conducted with eight patients who had rupture of very small intracranial aneurysms (less than 3 mm in size). All were treated using the Neuroform and the Enterprise stents; there was single stenting in five, in-stent telescopic stenting in two, and Y-configured stenting in one. The angiographic results with clinical outcomes were collected and analyzed. Complete aneurysm obliteration was observed in three cases, and size reduction or stable angiographic findings was found in five cases on the last follow-up angiography. No growing aneurysm or rebleeding was found on any follow-up angiography. Thromboembolic complications were found in one patient. It is difficult to make conclusions on the long-term efficacy of this technique with such a small number of cases, however sole stenting with a large cell intracranial stent for the treatment of very small aneurysms may be used safely as an alternative treatment even during an episode of SAH ³⁾.

¹⁾

Madaelil TP, Moran CJ, Cross DT 3rd, Kansagra AP. Flow Diversion in Ruptured Intracranial Aneurysms: A Meta-Analysis. *AJNR Am J Neuroradiol*. 2016 Dec 22. doi: 10.3174/ajnr.A5030. [Epub ahead of print] PubMed PMID: 28007770.

²⁾

Brinjikji W, Piano M, Fang S, Pero G, Kallmes DF, Quilici L, Valvassori L, Lozupone E, Cloft HJ, Boccardi E, Lanzino G. Treatment of ruptured complex and large/giant ruptured cerebral aneurysms by acute coiling followed by staged flow diversion. *J Neurosurg*. 2016 Jul;125(1):120-7. doi: 10.3171/2015.6.JNS151038. PubMed PMID: 26654182.

³⁾

Kim YJ, Ko JH. Sole stenting with large cell stents for very small ruptured intracranial aneurysms. *Interv Neuroradiol*. 2014 Jan-Feb;20(1):45-53. PubMed PMID: 24556299; PubMed Central PMCID: PMC3971140.

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