

Ischemic micro-lesions associated with flow-diverting stents for aneurysms

January 6 2015

The use of flow-diverting stents to treat intracranial aneurysms appears safe and highly successful. Recently, however, there have been reports of ischemic complications occurring in brain territories supplied by the parent artery in which the stent is placed and in brain regions fed by small arterial branches whose ostia are covered by the stent.

To determine the extent of these ischemic [complications](#) and their implications on [clinical outcomes](#) in [patients](#) who receive flow-diverting stents, researchers from Dupuytren University Hospital in Limoges, France, conducted a prospective single-center study in which 38 patients (7 male and 31 female) received flow-diverting stents to treat 49 intracranial aneurysms between January 1, 2012, and July 1, 2013. Forty aneurysms (82%) were specifically treated using flow-diverting stents, rather than coils or clips, because the aneurysms were considered anatomically challenging. Technical difficulties occurred during insertion of the flow-diverting stent in five patients, but nevertheless, treatment was deemed a technical success in all 49 aneurysms. Diffusion-weighted imaging was performed 24 hours before each procedure as well as 14-48 hours and 3 months after treatment. Clinical status and imaging findings before and after treatment were compared in patients who received flow-diverting stents, and these data were also compared with similar data in patients who underwent coil embolization of aneurysms during the same time period.

The authors, Christina Iosif, MD, MSc, PhD, and colleagues, report and discuss their findings in a new paper, "Diffusion-weighted imaging-

detected ischemic lesions associated with flow-diverting stents in intracranial aneurysms: safety, potential mechanisms, clinical outcome, and concerns," published today online, ahead of print, in the *Journal of Neurosurgery*.

In this study diffusion-weighted imaging (DWI) was used to identify ischemic micro-lesions. Hyperintense areas—bright "spots"—on the patients' DWI studies represented these lesions. These DWI spots were recorded with respect to their number, location, and size.

Within 48 hours after the flow-diversion procedure, 35 patients (92.1%) were found to harbor at least one ischemic micro-lesion; one patient had as many as seven micro-lesions. In total 84 new lesions were identified on DWI during this period. In most cases the micro-lesions were clinically silent; however, in five cases they were clinically relevant, with permanent deficits occurring in 3 cases (7.8%)—slight disability in one patient and moderate disability in two patients. Three late-occurring micro-lesions were identified by DWI during the follow-up period. All three were clinically silent.

The researchers compared the high incidence of clinically silent ischemic micro-lesions in patients who underwent flow diversion (86.9% of patients) with the incidence of these lesions in a comparison group of similar patients who underwent aneurysm coiling (35% of patients). The difference between the two groups was statistically significant ($p = 0.04$). The authors state this reveals "an increased embolic tendency with this type of device [that is, the flow-diverting stent], probably due to its mechanical properties and to the technical manipulations during the procedures."

In this study DWI spots that appeared early during the follow-up period were mostly located in tissue distal to the artery harboring the treated aneurysm; the authors believe that these spots suggest ischemic embolic

micro-lesions that were a consequence of treatment. Other DWI spots appeared later in the follow-up period, but only in territories fed by arterial branches whose ostia were jailed (that is, covered) by flow-diverting stents; the authors state that these ischemic events were primarily caused by hemodynamic factors, rather than embolic factors, and were due to a present, but inadequately developed, collateral arterial network competing for the perfusion of the brain territory of the jailed branches. As a new perfusion equilibrium is established, either by recruiting collateral arterial network or by arterial remodelling of the branch, symptoms usually regress.

An additional item investigated in this study was whether the location of an [intracranial aneurysm](#) treated with a flow-diverting stent has an effect on the number and clinical relevance of ischemic events. They researchers found no statistical difference between the number of clinically relevant complications and associated outcomes in patients with aneurysms located above or below the circle of Willis.

In summary, the authors state that the number of clinically silent ischemic lesions detected on DWI was much higher than they anticipated. Nevertheless, given the low permanent complication rate, they believe that the flow-diversion technique is safe and effective, and can be used both above and below the circle of Willis. The authors do caution, however, that in cases in which the flow-diverting stent may, of necessity, cover the entrance of an arterial branch, such as can occur in locations above the circle of Willis, the collateral blood supply should be examined carefully to predict whether late-occurring ischemic micro-lesions may occur.

When asked to summarize the findings of this study and their importance, Dr. Iosif stated: "The early appearance of embolic DWI lesions after flow-diverting stents have been placed in intracranial locations in patients receiving appropriate anticoagulation therapy,

although very frequent, seems to be free of clinical significance. When considering jailing a side arterial branch, special care should be taken to the competition of flow that may exist in the brain territory supplied by this branch. When an indirect collateral supply is present, due to the pial anastomotic network, the extent of the supply seems to determine whether late-occurring DWI [lesions](#) will appear during the jailed branch remodelling process.

"This study is the first step to understanding the complex hemodynamic mechanisms governing side branch behavior after insertion of a flow-diverting stent. Further laboratory and clinical research is mandatory to fully elucidate these mechanisms in order to arrive at the point where most consequences of jailing a side branch can be predicted during therapeutic strategy decision-making."

More information: Iosif C, Camilleri Y, Saleme S, Caire F, Yardin C, Ponomarjova S, Boncoeur-Martel MP, Mounayer C: Diffusion-weighted imaging-detected ischemic lesions associated with flow-diverting stents in intracranial aneurysms: safety, potential mechanisms, clinical outcome, and concerns. *Journal of Neurosurgery*, published online, ahead of print, January 6, 2015; [DOI: 10.3171/014.10.JNS132566](https://doi.org/10.3171/014.10.JNS132566)

Provided by Journal of Neurosurgery

Citation: Ischemic micro-lesions associated with flow-diverting stents for aneurysms (2015, January 6) retrieved 26 April 2024 from <https://medicalxpress.com/news/2015-01-ischemic-micro-lesions-flow-diverting-stents-aneurysms.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.