PHILIPS

Image guided therapy

Neuro suite

AneurysmFlow

Enhance insight into cerebral aneurysm flow

Key benefits

- Visualizes blood flow patterns in the parent vessel and aneurysm sac and quantifies blood flow rates in the parent vessel
- Quantifies the change in aneurysm flow immediately after flow diverter deployment
- Calculates the change in Mean Aneurysm Flow Amplitude (MAFA value) before and after procedure, representing change in blood flow in aneurysm

Our Philips Azurion Neuro suite integrates live X-ray, multi-modality imaging, and patient information to help you open doors to new procedures and techniques, and deliver relevant clinical value where it's needed most – at the point of patient treatment.

Currently, a combination of conventional digital subtraction angiography (DSA) and three-dimensional rotational angiography (3DRA) is the gold standard for imaging during cerebral aneurysm treatment. Although these techniques can provide valuable information about the morphology of vasculature, they provide limited functional information about flow. What's more they do not allow immediate assessment of actual changes in blood flow, an important element when deploying embolization devices, such as flow diverters. AneurysmFlow is designed to give interventionalists relevant information right after deployment based on quantification of blood flow changes.

It is the first interventional tool that visualizes flow patterns inside the aneurysm sac when using a flow diverter device. This information can be used to assist during flow diverter deployment.

Greater insight and confidence

in finding and treating the problem

The clinical need

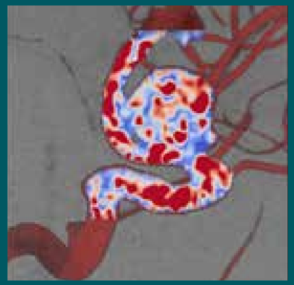
Flow diverters are being increasingly used to treat cerebral aneurysms, but flow diversion procedures remain challenging. Only 76% of all aneurysm flow diversion cases result in thrombosis after 6-month follow-up,[1] which poses a risk to the patient. Various publications have shown that the flow pattern inside aneurysms is considered one of the parameters that can be used to predict rupture and clotting after device deployment.[2,3] Until now, there was a lack of clinical assessment methods to quantify flow patterns and measure changes in the blood flow during the procedure. Conventional DSA and 3DRA images cannot provide this quantitative information. Offering immediate insights in flow changes would clearly benefit physicians to assess treatment efficacy after flow diverter placement.

AneurysmFlow is the first tool that visualizes and quantifies flow changes in the parent vessel and aneurysm before and after flow diverter deployment. These changes are captured in a metric – the Mean Aneurysm Flow Amplitude (MAFA) ratio.

Based on the optical flow principle

AneurysmFlow uses novel algorithms based on the optical flow principle to convert information from a 3DRA acquisition and 2D DSA flow sequences of 60 frames per second into quantitative flow values. These values are used to visualize and quantify flow dynamics before and after flow diverter deployment in cerebral aneurysms.

With AneurysmFlow, flow can be visualized in different ways as shown below.



A **contrast flow** visualizes blood flow velocities – per frame or as a run average. The color legend can be adapted to magnify differences in velocity.

A **vector field** uses arrows to visualize speed and direction of blood moving within the aneurysm sac and parent vessel.

The following parameters are automatically measured within the region of interest defined:

- Time averaged arterial flow
- Time and spatially averaged projected aneurysm flow
- Mean Aneurysm Flow Amplitude (MAFA) ratio

Users can also view the following information as graphs:

- Time dependent arterial flow
- Time dependent, spatially averaged projected aneurysm flow

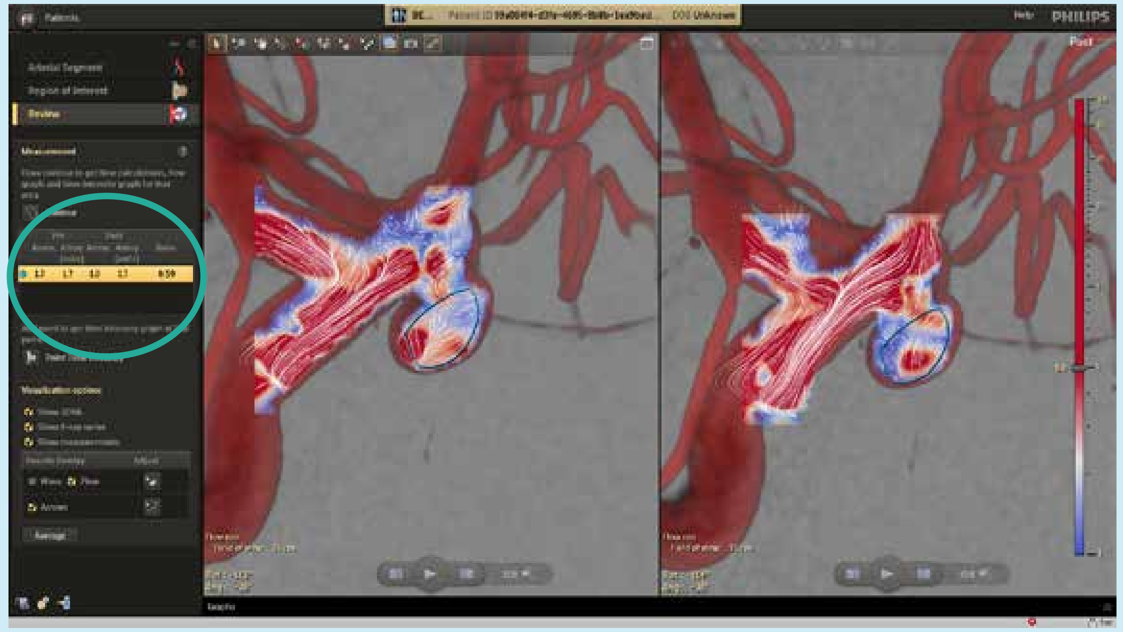
New information with Mean Aneurysm Flow Amplitude (MAFA) ratio

The Mean Aneurysm Flow Amplitude (MAFA) ratio represents the change in blood flow in the aneurysm after flow diverter deployment. The MAFA ratio is derived by comparing the average projected velocity of the blood flow in the aneurysm before and after flow diverter deployment. This ratio is corrected for average change in the velocity of the blood flow in the primary feeding vessel to the aneurysm.

Case Report

Case courtesy of Prof. Laurent Spelle, Hôpital Bicêtre, Paris, France

- Patient: Female, 35 years old.
- Saccular aneurysm in internal carotid artery.
- Exam date: June 16, 2014, Flow Diverter placement.
- AneurysmFlow MAFA of 0.59
- Follow-up exam: December 19, 2014, Total aneurysm occlusion.

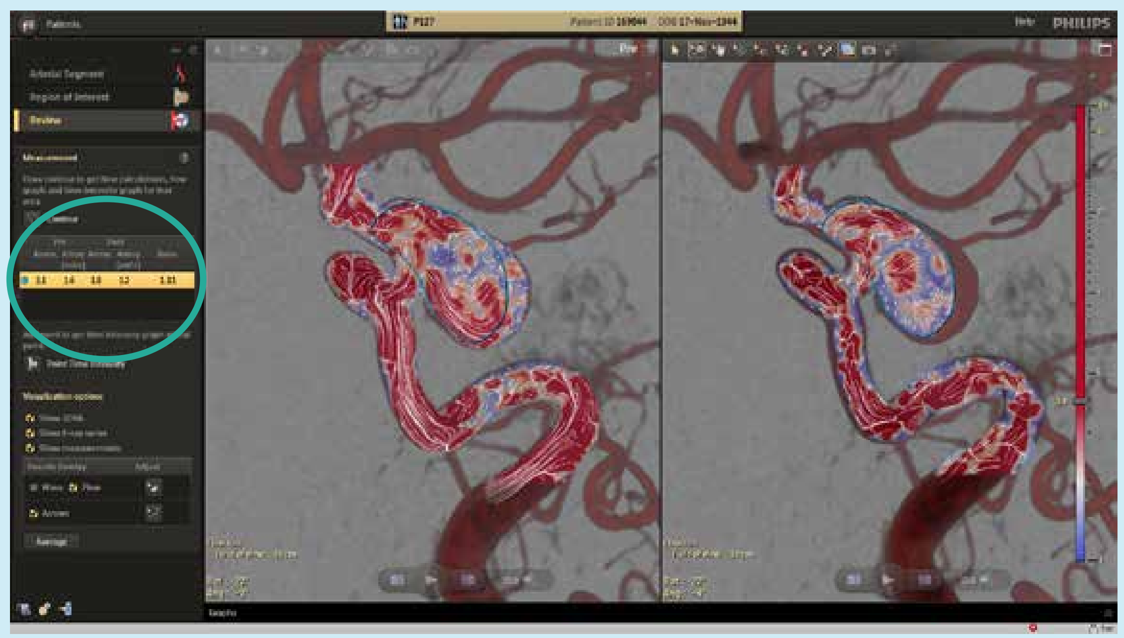


The clinical user relies on conventional DSA imaging which is the primary source of information throughout the procedure.

Case Report

Case courtesy of Dr. Vitor. Mendes Pereira, UHN, University of Toronto, Toronto, Canada

- Patient: Female, 67 years old.
- Saccular aneurysm in internal carotid artery.
- Exam date: July 19, 2012, Hôpital Universitaire de Geneva, à Flow Diverter placement.
- AneurysmFlow MAFA of 1.11
- Follow-up MRI exam at 3, 6 and 12 months showed incomplete occlusion.
- Angiogram 2 years after flow diverter placement clearly shows residual aneurysm.
- Additional flow diverter placed 3 months later (not shown).



The clinical user relies on conventional DSA imaging which is the primary source of information throughout the procedure.

Better user experience

to promote consistency and efficiency

AneurysmFlow is designed to allow fast and easy assessment of saccular cerebral aneurysms with embolization devices, such as flow diverters during endovascular treatment. Data acquisition can be controlled at the tableside during the normal workflow, while analysis is performed in the control room.

Increase economic value

Count on us as your patients count on you

Staying on top of today's complex and ever changing healthcare environment is challenging enough. The last thing you need to be concerned with is keeping your care systems up and running smoothly.

At Philips, we work as one with your teams. We share their dedication to solve issues before they start and their drive to keep going day and night until the job is done. With us taking care of your systems you can focus on what really matters – delivering better care, to more people, at lower cost. Together we can create a healthier future.

1 Brinjikji W, Murad MH, Lanzino G. et al. Endovascular treatment of intracranial aneurysms with flow diverters: a meta-analysis. Stroke. 2013;44:442–447.

2 Augsburger L, et al. Methodologies to assess blood flow in cerebral aneurysms: Current state of research and perspectives. J Neurorad. 2009;36:270–277.

3 Sforza DM, Putman CM, Cebral JR. Hemodynamics of Cerebral Aneurysms. Annu Rev Fluid Mech. 2009; 41:91–107.

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