

35 Year-old Female with Bilateral Carotid Occlusion

NOVA™

Case No. 006

The 1985 EC-IC trial concluded that surgical revascularization of patients with carotid occlusion was no better than medical therapy alone in patients with ipsilateral TIA or stroke.¹ Over the past 20 years significant advances in non-invasive neurological imaging have resulted in a better understanding of the flaws of this conclusion and revascularization is once again being considered in select patients with carotid occlusion. NOVA MRA provides non-invasive estimation of individual cerebral vessel blood flow and in the following case proves adequate cerebral flow reserve in a patient with not only unilateral but bilateral carotid occlusion. While there are undoubtedly a subset of patients that may be shown to benefit from bypass, this case illustrates how NOVA data helped to confirm the lack of a surgical indication and validated quantitatively that vascular reserve can be safely maintained in a patient with not only unilateral but bilaterally compromised extracranial carotid artery flow.

Patient History

- ❖ 35 year-old right-handed woman
- ❖ Hypertensive, hypercholesterolemia
- ❖ 1 pack per day smoker
- ❖ Presented with a one-week history of left leg weakness and difficulty walking.

Diagnostic Workup

- ❖ The MRI of the brain revealed bilateral watershed ischemic infarctions (R>L) while the MRA findings suggested bilateral ICA occlusions with a widely patent vertebrobasilar system.

NOVA was performed in conjunction with the MRA to quantify cerebral vessel blood flow and direction. NOVA QMRA demonstrated that the intracranial circulation (anterior) was preserved despite the presence of bilateral ICA occlusions. There is left-to-right cerebral blood flow through the anterior communicating artery which maintains the symmetry in blood flow between the left and right middle cerebral arteries (Figure 1).

Angiography revealed collateral flow originating from the ethmoidal branches of the external carotid artery to the inferolateral (ILT) trunk of the internal carotid artery and vertebrobasilar to ICA collateral through the left posterior communicating artery. While angiography showed the existence of qualitative collateral, the NOVA study provided the quantitative measure of MCA flow

nova™ 3D rendering of the CIRCLE of WILLIS

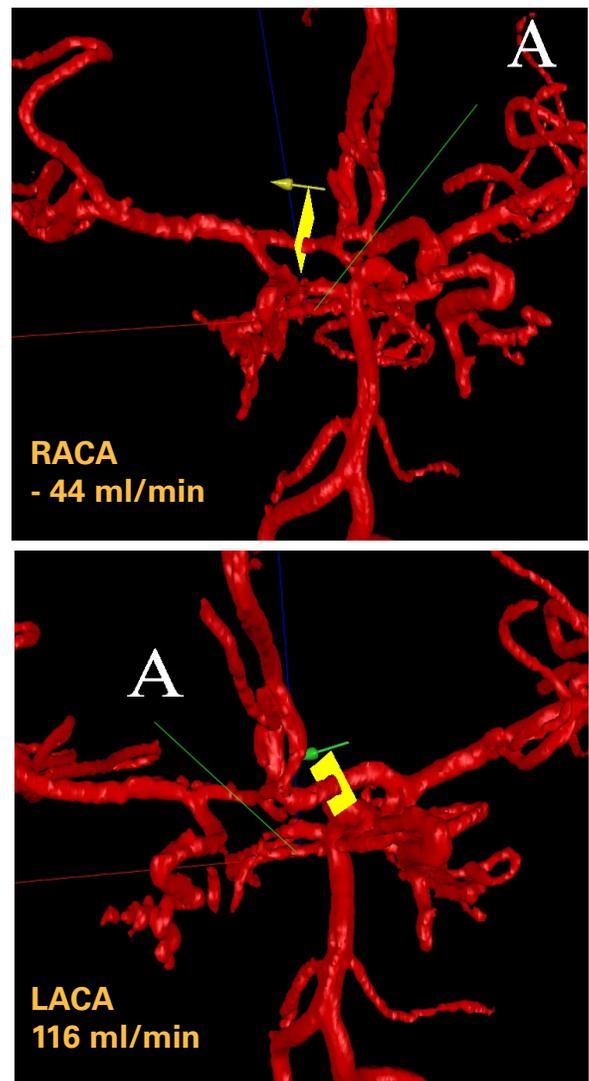
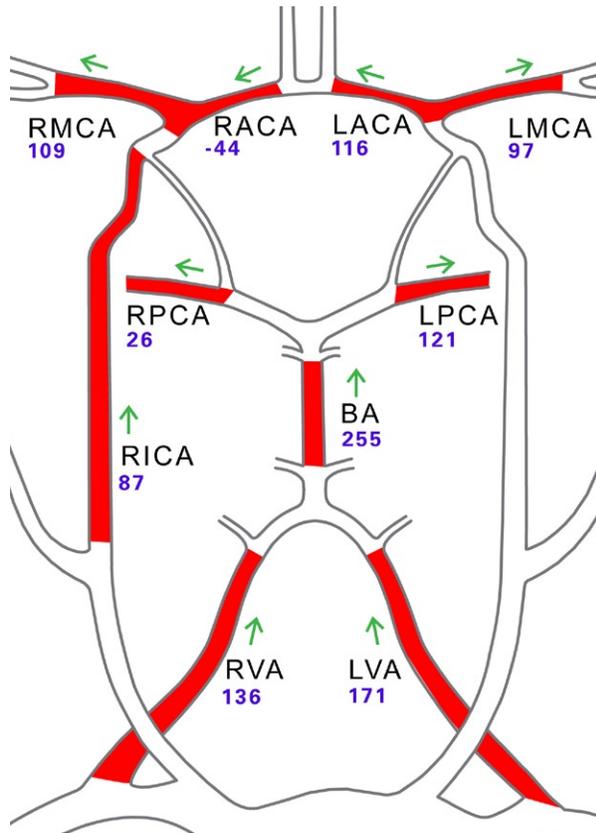


Figure. 1 The perpendicular slice for quantitative flow measurement is shown for the RACA(top) and LACA(bottom). Flow direction is left to right through the ACOMM, indicated by the direction of flow in the RACA (yellow arrow,top).

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and confirmed that it was maintained within the normal range in both middle cerebral arteries (Figure 2).

Further workup with SPECT Diamox showed no evidence of reversible ischemia, although the patient was noted to have some hypoperfusion in the right side from her stroke.

vessel	flow mL/min	range* mL/min
LVA	171	80-170
RVA	136	90-170
RICA	87	180-310
BA	255	160-260
LMCA	97	110-210
RMCA	109	100-200
LACA	116	60-170
RACA	-44	60-160
LPCA	121	50-100
RPCA	26	50-100

Figure. 2 NOVA Vessel Map (left) shows quantitative flow values and direction of flow (green arrows). NOVA Baseline Table (right) provides references to normal ranges (3rd column from left), provides references to normal ranges (3rd column from left).

Conclusion

❖ Presumably acute carotid occlusion resulted in the patient’s initial stroke and symptomatic onset. Following this acute episode, collateral flow recruitment likely resulted in early onset MCA flow maintenance utilizing ECA to ILT and Pcom to carotid collaterals.

NOVA QMRA demonstrated that even in the presence of bilateral carotid occlusions, MCA flow was maintained in the normal range. Therefore the patient was felt to be presently at a low risk for stroke.

The patient is being managed conservatively on medical therapy with no further recurrence of symptoms. However, given that the patient is highly dependent on posterior and external carotid collateral flow, any vertebrobasilar disease that develops should be treated aggressively, as the patient could then potentially be at high risk of MCA stroke. Additionally, careful management of blood pressure is paramount to good outcome with overtreatment of blood pressure possibly compromising the collateral blood supply.

NOVA QMRA provides us with a non-invasive tool to follow patients with cerebrovascular occlusive disease and to quantitatively understand the dynamic aspects of cerebral blood flow through the Circle of Willis and its collaterals.

¹ Reference: The EC/IC Bypass Study Group: Failure of Extracranial/Intracranial Arterial Bypass to Reduce the Risk of Ischemic Stroke. Results of an International Randomized Trial. N Engl J Med Vol 313: 1191-1200, 1985

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