

# NOVA documents global reduction in cerebral blood flow during an episode of atrial fibrillation

## Patient History

- ❖ 69 year old female
- ❖ Carotid artery stenosis
- ❖ Ophthalmic artery aneurysm

## Summary

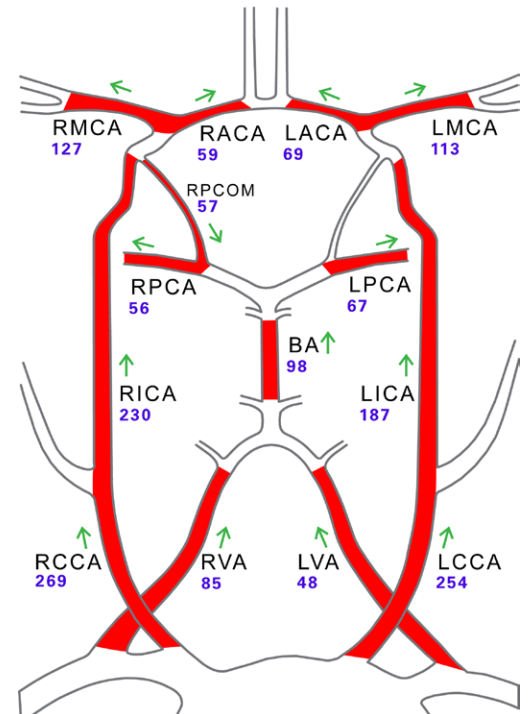
- ❖ This is a patient who underwent two NOVA studies 3 months apart. She has intracranial disease and an incidentally found ophthalmic aneurysm. Her total cerebral blood flow was reduced on the second study, concurrent with an episode of atrial fibrillation.

## Initial NOVA Study

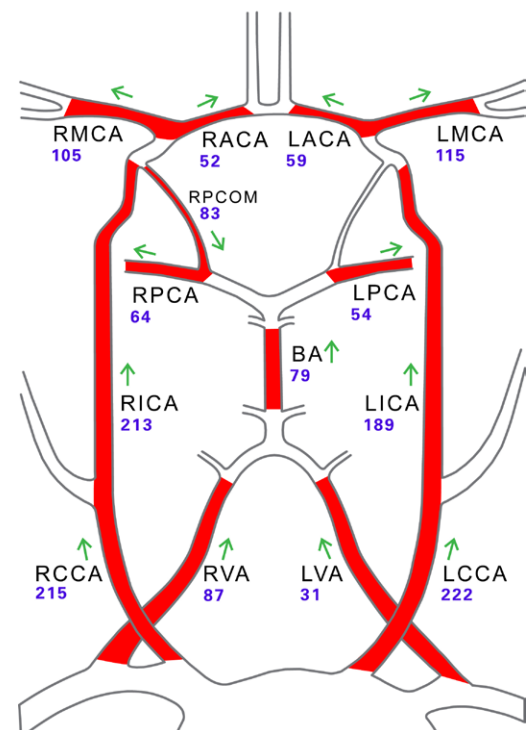
- ❖ Anatomical findings: There appears to be bilateral stenosis of the internal carotid arteries as they enter the petrous segment in the skull base. There is also a small right carotid ophthalmic aneurysm. The right posterior cerebral artery (RPCA) has a fetal origin from the right internal carotid artery (RICA).
- ❖ Anterior Circulation Flows: On the Right side, the RICA flow remains normal despite the stenosis. The RMCA flow is also normal. On the left side, the LICA flow is just below the lower limit of normal. The LMCA is at the lower limit of normal.
- ❖ Posterior Circulation Flows: The basilar artery flow is physiologically reduced because of the fetal origin of the RPCA. Flows are otherwise normal.

### Impression:

- ❖ Bilateral ICA stenosis at the skull base, hemodynamically more significant on the Left. A partial differential includes atherosclerosis vs. dissection. No hemodynamic flow augmentation procedure needed at this point. However, clinical and NOVA follow-up is suggested.
- ❖ Small Carotid Ophthalmic aneurysm. Unchanged.



**Figure. 1** Initial Study: Total cranial blood flow (the sum of the common carotid arteries and the vertebral arteries) is 656 ml/min



**Figure. 2** 3 Month Follow up Study: Total cranial blood flow is 555 ml/min

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vessel	flow mL/min (%TCF)	range* mL/min
<b>Total Cranial Flow (TCF)</b>	656	770-1460
LCCA	254 (39%)	300-550
RCCA	269 (41%)	310-570
LVA	48 (7%)	80-170
RVA	85 (13%)	90-170
LICA	187 (29%)	190-340
RICA	230 (35%)	180-310
BA	98 (15%)	160-260
LMCA	113 (17%)	110-210
RMCA	127 (19%)	100-200
LACA	69 (11%)	60-170
RACA	59 (9%)	60-160
LPCA	67 (10%)	50-100
RPCA	56 (9%)	50-100
RPCOM	57 (9%)	-

**Figure. 3** NOVA Baseline Table from the initial study. Measured flows in each vessel and comparative normal ranges.

## Follow up NOVA study 3 months later

- ❖ Patient was in atrial fibrillation, therefore a non-cardiac gated protocol was used. There is a 15% global reduction in cerebral blood flow to 555 ml/min from 656 ml/min total cranial flow measured on the initial study.

### Impression:

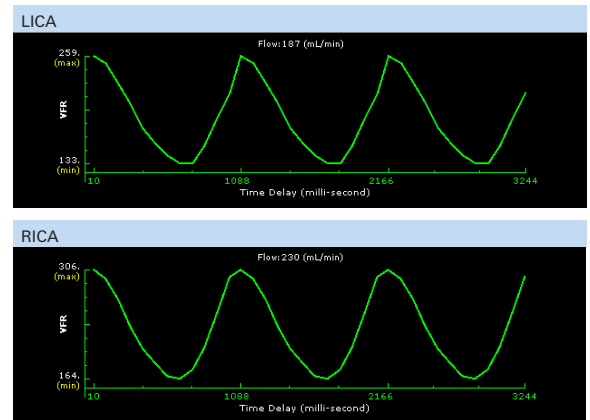
- ❖ The total CBF has decreased globally. However, the relative distribution of CBF in the major vascular territories remained similar to the previous study. No changes in the appearance of the vasculature.

## Conclusions

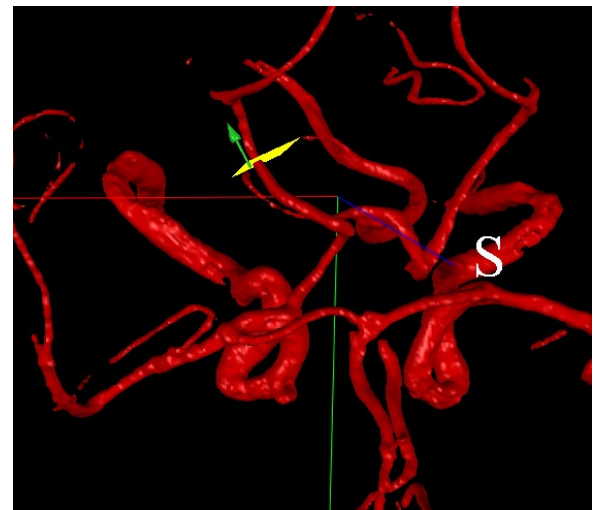
This patient had two NOVA MRA studies done at 3 months interval. On the initial study the patient was in normal sinus rhythm. On the second study, she was in atrial fibrillation. NOVA clearly documented the decrease in her total cerebral blood flow, consistent with a reduction in cardiac output that accompanies atrial fibrillation.

### Acknowledgements:

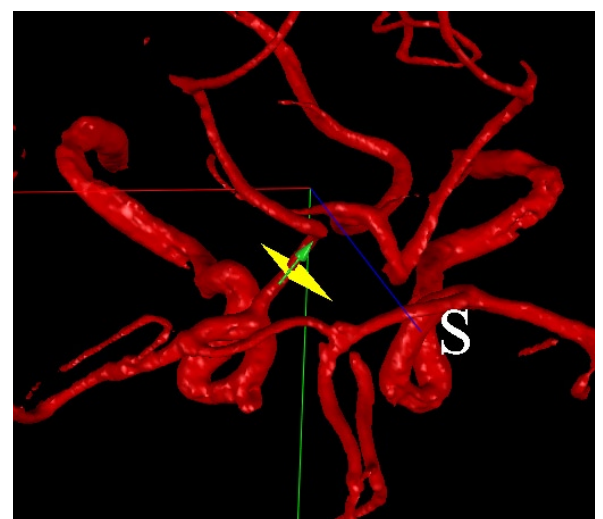
We thank Fady T. Charbel, M.D, Head of the Department of Neurosurgery at UIC Medical Center, for his assistance.



**Figure.4** Representative Pulsatile volume flow waveforms from the cardiac gated study. Patient was in normal sinus rhythm.



**Figure. 5** Slice Plane through the distal right posterior cerebral artery (labelled RPCA on the NOVA report)



**Figure. 6** Slice plane through the proximal segment of the right posterior cerebral artery which is fetal in origin (labelled RPCOM on the NOVA report)