

NOVA provides early warning of impending stroke in patient with right-sided TIA

Patient History

- ❖ 58-year-old male, 8th grade teacher
- ❖ Presented with a right-sided TIA

Baseline NOVA QMRA Study

- ❖ NOVA QMRA was performed concurrently with an MRA to quantify blood flow in the cerebral vessels.

The baseline NOVA study shows a marked asymmetry in blood flow between the left and right hemispheres (Figure 1). Flow in the left MCA is only 46% of the flow in the right MCA. (67 ml/min in the LMCA vs. 149 ml/min in the RMCA).

Along with the relative hypo-perfusion on the left side, the LMCA waveform exhibits a pre-occlusive morphology with steep peaks and troughs (Figure 2).

Based on the low flow and pre-occlusive waveform in the left MCA, angioplasty and stenting of the vessel were recommended. The patient however declined further treatment and left the hospital against medical advice.

Within 48 hours the patient suffered a stroke. Fortunately, with urgent intervention, a stent was placed in the left MCA.

Post Treatment NOVA Study

- ❖ Following left middle cerebral artery stenting, flow in this vessel increased from 67 to 88 ml/min. Hemispheric symmetry also improved, with left MCA flow now making up 84% of the flow in the right MCA (Figure 3).

Post-stenting, the waveform morphology in the left MCA more closely resembles the waveform seen in the right MCA (Figure 4). Note that flow in the left ACA, which was not measurable (see pre op 3D model, Figure 5) before intervention, is now 83 ml/min, while flow in the left internal carotid artery increased from 85 ml/min to 190 ml/min. This overall improvement in left-sided flow is likely due to the decrease in vascular resistance following stenting.

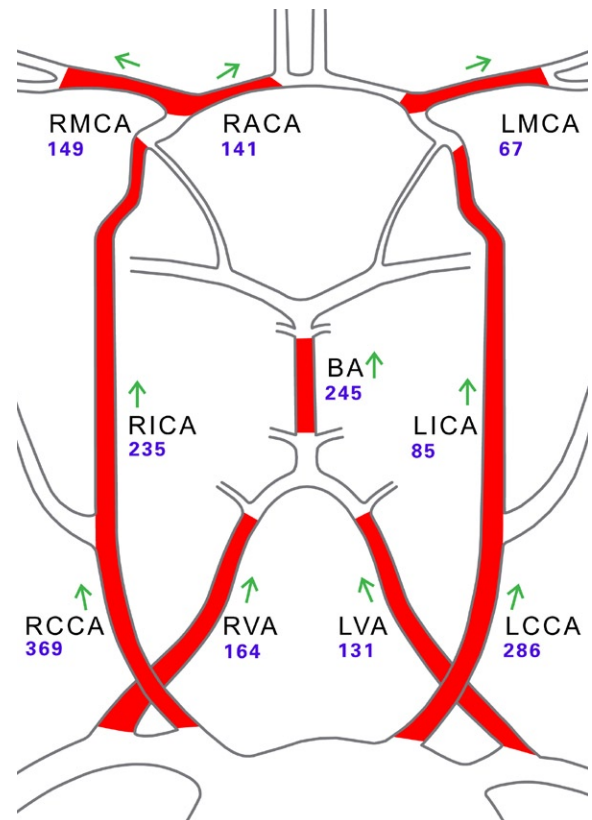


Figure. 1 NOVA Vessel Map - Baseline Study

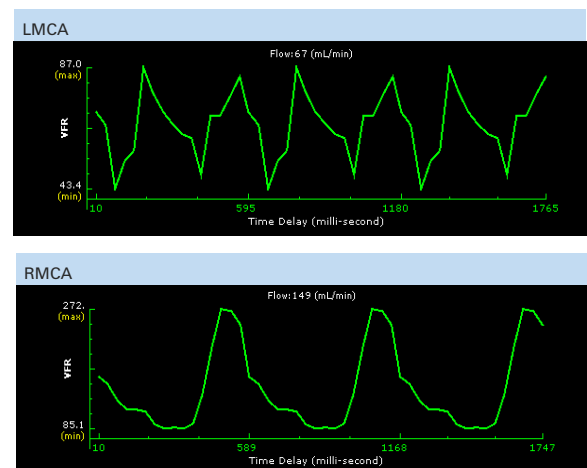


Figure. 2 Volumetric flow waveforms for the left middle cerebral (LMCA) and right middle cerebral arteries (RMCA). The steep slope and sharp peaks on the LMCA waveform suggest near occlusion.

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On the right side, flow in the anterior cerebral artery has decreased, reflecting less demand for right-to-left collateral through the anterior communicating artery following left MCA stenting.

1 year post op NOVA

- Follow up NOVA study at 12 months post LMCA stenting shows continued good flow in the left hemisphere.

Conclusions

- NOVA diagnosed a critical perfusion deficit secondary to the LMCA stenosis evidenced by the low flow in the LMCA and the accompanying waveform which signaled an impending stroke.
- NOVA supported the need for intervention on this stenosis.
- NOVA demonstrated quantitative improvement in left sided flow following LMCA stenting, with significant increases shown in LMCA, LACA and LICA.
- Quantitative vessel flow and 4D resolution of waveform morphology may provide early warning of vessel occlusion.
- Patients can be followed non-invasively with NOVA QMRA.

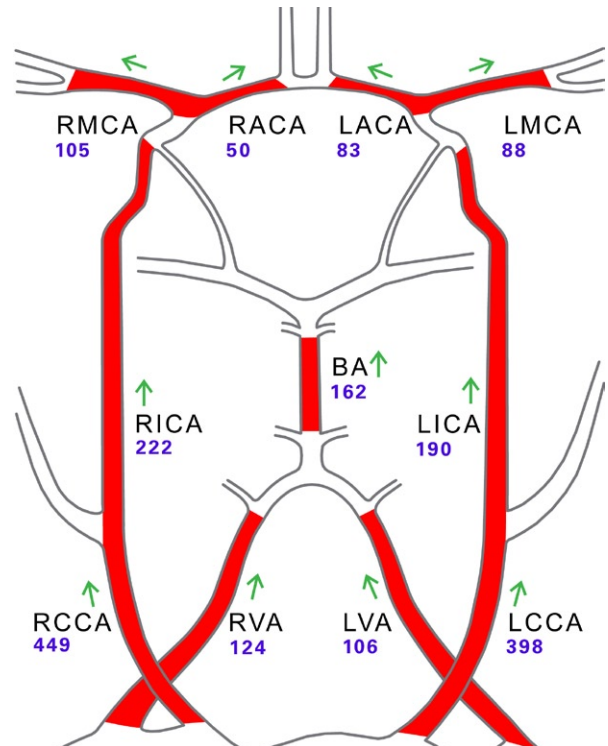


Figure. 3 NOVA Vessel Map - Post Stent

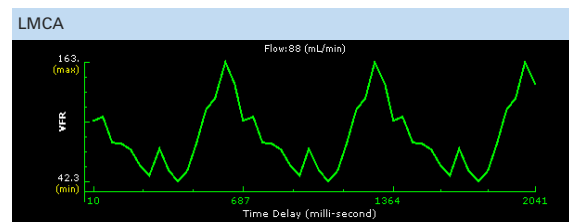


Figure. 4 LMCA Waveform - Post Stent



Figure.5 NOVA 3D Model of the Circle of Willis, Pre (image at left) and Post Stent (right). Note the absence of flow in the left anterior cerebral artery on the pre -stent image. Yellow plane shows perpendicular slice for flow measurement in the basilar artery.

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