

## **SURGICAL REVASCULARIZATION REVERSES CEREBRAL CORTICAL THINNING IN PATIENTS WITH SEVERE CHRONIC CEREBROVASCULAR DISEASE**

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**Introduction:** Chronic severe cerebrovascular steno-occlusive disease may lead to a paradoxical reduction in cerebral blood flow when a vasoactive stimulus is applied (steal physiology). Brain areas demonstrating steal physiology show cortical thinning, despite absence of other signs of tissue injury on structural MR imaging. Here we test whether revascularization may reverse cortical thinning in patients with severe chronic cerebrovascular disease.

**Methods:** Twenty-five cases with pre and post revascularization cerebrovascular reactivity (CVR)-MR imaging studies were analyzed with following inclusion criteria: 1) pre revascularization CVR map demonstrating steal physiology; 2) post revascularization CVR map demonstrating no steal physiology in the same area; 3) normal appearing cortex on structural MR imaging. Using Freesurfer software, an inflated cortical surface was created. A region of interest (ROI) containing the area of steal physiology was determined by overlaying the pre revascularization CVR map onto the cortical surface. This ROI was copied to the healthy hemisphere and the post revascularization cortical surface for cortical thickness comparison.

**Results:** In each of the revascularized hemispheres, cortical thickness increased. Mean thickness increase was 5.1% pre versus post revascularization (2.40 mm ( $\pm 0.16$ ) versus 2.53 mm ( $\pm 0.16$ ), respectively;  $p < 0.000001$ ).

**Conclusions:** Patients with regional steal physiology undergoing successful revascularization show increased cortical thickness. For the first time, we provide evidence that cerebral revascularization dramatically reverses thinning of the cerebral cortex. The anatomic correlate of this increase in cortical thickness is unclear, but given the potential that this represents improvement in a neuronal/glial process; the result may have important implications regarding its impact on neurocognition.