**Publication Brief**

**Combined Direct and Indirect Bypass for Moyamoya: Quantitative Assessment of Direct Bypass Flow Over Time**

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**BACKGROUND**
The optimal revascularization strategy for symptomatic adult moyamoya remains controversial. One strategy is direct bypass which offers immediate revascularization. Another strategy is indirect bypass which can effectively induce collaterals over time.

**OBJECTIVE**
Angiography and quantitative magnetic resonance angiography (QMRA) we used to examine the relative contributions of direct and indirect bypass in moyamoya patients following combined direct superficial temporal artery to middle cerebral artery (STA-MCA) bypass and indirect encephaloduroarteriosynangiosis (EDAS).

**METHODS**
A retrospective review of moyamoya patients undergoing combined STA-MCA bypass and EDAS was conducted. Pediatric patients and patients with hemorrhagic presentation were excluded from the review. Included were:

- Patients with QMRA measurements of the direct bypass immediately and >6 months postoperatively;
- Patients who had angiographic follow-up, when available, for assessment of EDAS collaterals at similar time intervals.

**RESULTS**
Of 16 hemispheres in 13 patients, 11 (69%) demonstrated a significant (>50%) decline in direct bypass flow at >6 months compared to baseline, averaging a drop from 99±35 ml/min to 12±7 ml/min. Conversely, angiography in these hemispheres demonstrated prominent indirect collaterals, in concert with shrinkage of the STA graft. Decline in flow was apparent at a median of 9 months, but was evident as early as 2 to 3 months.

**CONCLUSION**
From this small sample, it appears that a reciprocal relationship between direct STA bypass flow and indirect EDAS collaterals frequently occurred. This supports the hypothesis that combined direct/indirect bypass can provide temporally complementary revascularization.

**TRANSONIC NOTE**
The Charbel-Amin-Hanjani team uses intraoperative flow measurements when they construct an EC-IC (STA-MCA) direct bypass.

**Reference**