

**Introduction**

Arterial spin labeling (ASL) MRI has been shown to accurately detect degree of collateral cerebral blood flow (CBF). In this study, we analyzed whether ASL can be applied to pediatric Moyamoya disease (MMD) to detect response after surgical revascularization.

**Methods**

A total of N=229 patients underwent surgical revascularization for MMD from 1/1/2010-1/1/2013 by a single neurosurgeon (G.K.S.), including N=58 (25%) pediatric cases. All children with both a 3T-MRI with ASL (ASL) at baseline and a matched follow-up scan at least 6 months later were included. Regions of interest were drawn by a neuroradiologist (K.W.Y.) blinded to patient status to measure CBF in vascular territories supplied by ACAs, MCAs, lenticulostriates (i.e., collateral “moya-moya” vessels), and PCAs.

**Results**

A total of N=10 children (age 10.5±4.8, range 1-18) met inclusion criteria, including N=8 undergoing direct STA-MCA bypass, N=1 undergoing indirect EDAS, and N=1 under medical management only. Last follow-up ASL was performed on average 9±4 months after baseline. All 9/9 patients (100%) undergoing surgical revascularization experienced increased left MCA distribution CBF and 8/9 patients (89%) experienced increased right MCA distribution CBF. Interestingly, 7/8 (88%) direct bypass patients experienced decreased lenticulostriate CBF, while 1 patient undergoing indirect EDAS was the only patient to experience bilateral increases in lenticulostriate CBF. The 1 patient managed medically was the only patient to experience decreased bilateral ACA/MCA CBF, as well as the only patient with no change in lenticulostriate CBF bilaterally.

**Conclusions**

Direct bypass was associated with increased MCA distribution CBF and reduced lenticulostriate (collateral “moya-moya” vessel) CBF. Indirect EDAS also was associated with increased MCA distribution CBF, however was associated with increased lenticulostriate CBF. Medical management was associated with decreased CBF in bilateral ACA/MCA distributions and concomitant increased lentriculostriate CBF. These data for the first time suggest ASL MRI can noninvasively detect changes in CBF characteristic of successful surgical revascularization in pediatric MMD.

**Learning Objectives**

Arterial spin labeling MRI as a novel tool for measuring cerebral blood flow in surgical revascularization

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