

Magnetic resonance imaging for Moyamoya Disease Diagnosis

4D flow MRI for Moyamoya disease diagnosis

Arterial spin labelled imaging for Moyamoya disease.

MRA usually discloses the stenosis or occlusion of the ICA. Moyamoya vessels appear as **flow voids** on MRI (especially in basal ganglia) and a fine network of vessels on MRA and are demonstrated better in children than adults. Parenchymal ischemic changes are commonly shown, usually in watershed areas.

MRI images show:

1) diminished **blood flow** in the **internal carotid artery** (ICA) and the **middle cerebral artery** (MCA) and **anterior cerebral artery** (ACA) and 2) prominent collateral **blood flow** at the base of the brain. To confirm the diagnosis of **moyamoya disease**, an **angiogram** is typically required.

Diagnostic criteria of definitive moyamoya disease include all of the following items based on the conventional angiographic findings.

- (1) Stenosis or occlusion of the terminal portion of the intracranial ICA or proximal portions of the anterior cerebral artery (ACA) and/or the middle cerebral artery (MCA).
- (2) Development of abnormal vascular networks near the occlusive or stenotic lesions in the arterial phase.
- (3) Bilateral lesion ¹⁾.

Results demonstrate distinct alterations in the temporal correlations of low-frequency **BOLD** signals, predominantly in resting-state networks in **moyamoya disease**. Additionally, **Resting-state functional magnetic resonance imaging** (rs-fMRI) measures were associated with ischemic motor-related symptoms and cognitive performance in the patients. Thus, rs-fMRI may offer a useful non-invasive method of acquiring additional information beyond cerebral perfusion as part of clinical investigations in patients with **moyamoya disease** ²⁾.

Territorial **arterial spin labeling** (t-ASL) could reveal comprehensive **Moyamoya disease** (MMD) cerebral blood **perfusion** and the vivid perfusion territory shifts fed by the unilateral ICA and ECA and bilateral **vertebral arteries** (VAs) in a noninvasive, straightforward, nonradioactive, and nonenhanced manner. 3D **Time-of-flight magnetic resonance angiography** (3D-TOF-MRA) could subdivide t-ASL perfusion territory shifts according to their shunt arteries. A perfusion territory shift attributable to the secondary collaterals is a potential independent risk factor for preoperative **hemorrhage** in MMD patients. A perfusion territory shift fed by the primary collaterals may not have a strong effect on preoperative hemorrhage in MMD patients. These findings make the combined modalities of t-ASL and 3D-TOF-MRA a feasible tool for MMD disease assessment, management, and surgical strategy

planning ³⁾.

Akiyama et al. showed excellent results in terms of accuracy of differential diagnosis of moyamoya disease using AI with the conventional T2 weighted images. The authors suggest the possibility of diagnosing moyamoya disease using AI technique and demonstrate the area of interest on which AI focuses while processing magnetic resonance images ⁴⁾.

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