

# Intraoperative Hemodynamic Monitoring for the Surgery of STA-MCA Bypass in the Occlusive Cerebrovascular Disease by Intraoperative MRI

Fengping Zhu; Ying Mao MD; Liangfu Zhou

Department of Neurosurgery, Hua Shan Hospital, Fudan University, Shanghai, China



## Introduction

To use 3.0T intraoperative magnetic resonance imaging (iMRI) to quantitatively monitor the hemodynamic change after superficial temporal artery-middle cerebral artery (STA-MCA) bypass in the cerebrovascular obstructive disease (CVOD) and explore the clinical efficacy of iMRI in the STA-MCA bypass surgery.

## Methods

25 patients with occlusive cerebrovascular disease treated with STA-MCA bypass in the iMRI suite were recruited. iMRI, including intraoperative quantitative magnetic resonance angiography (qMRA), perfusion-weighted imaging (PWI) were performed before and after STA-MCA bypass. The blood flow of STA was measured by the qMRA. Cerebral blood flow (CBF), cerebral blood volume (CBV), and mean transit time (MTT) of one hemisphere in the region of middle cerebral artery (MCA) distribution and contralateral mirroring areas were measured. Relative PWI values (rCBF, rCBV, rMTT) were also obtained. Differences in pre- and post-operative PWI values and the blood flow of STA were assessed. Differences of rCBF values and the blood flow of STA in the group with and without hyperperfusion syndrome were assessed.

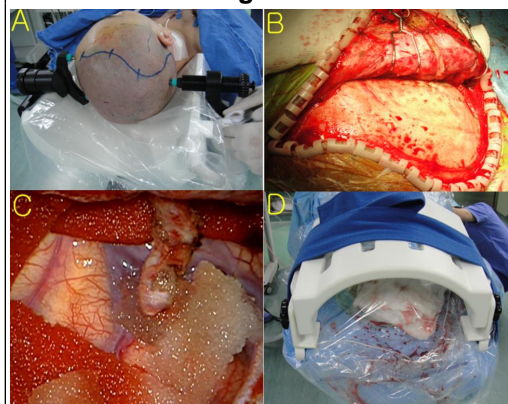
## Results

All graft patencies were displayed using the intraoperative 3D TOF-MRA images. Postoperative rCBF and rCBV values of surgical side in the region of MCA were significantly higher than those before operation ( $P < 0.05$  for all). Postoperative rMTT values of the surgical side in the region of MCA were significantly lower than those before operation ( $P < 0.05$ ). Postoperative rCBF values, the change in rCBF values of the surgical side in the region of MCA in the group with hyperperfusion syndrome were significantly higher than those without hyperperfusion syndrome ( $P < 0.05$  for all). Postoperative STA blood flow values of the surgical side were significantly higher than those before operation ( $P < 0.05$ ). Postoperative STA blood flow values, the change in STA blood flow values of the surgical side in the group with hyperperfusion syndrome were higher than those without hyperperfusion syndrome, however, there were no significant difference ( $P > 0.05$  for all).

## Conclusions

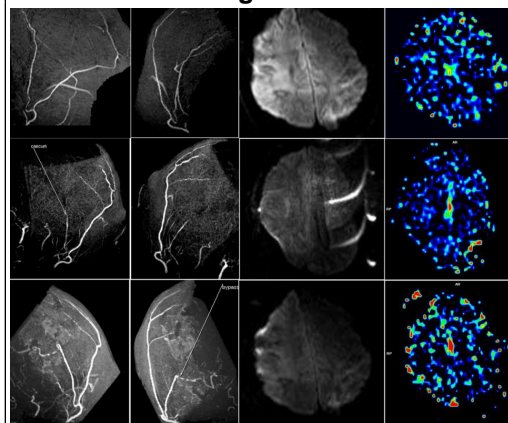
High-field intraoperative MRI is valuable for the non-invasive assessment of both the graft patency and cerebral hemodynamic change in the STA-MCA bypass surgery for occlusive cerebrovascular disease by performing quantitative MRA and PWI analysis.

Figure 1



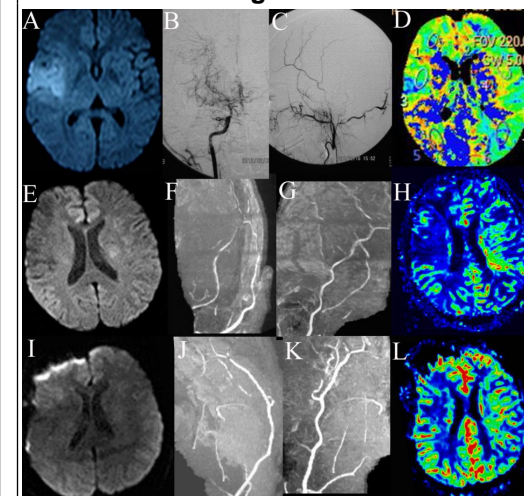
Patient's head and coil placement

Figure 2



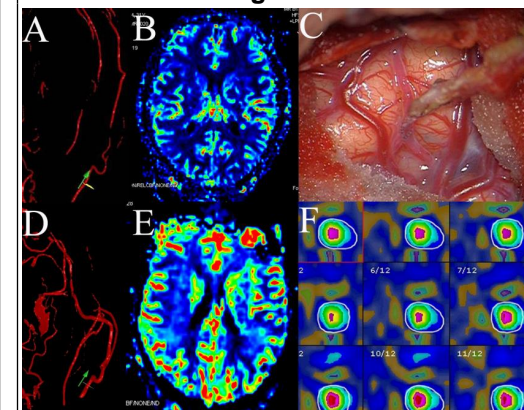
Illustrative case 1, intraoperative MRA, DWI and ASL

Figure 3



Illustrative case 2, intraoperative MRA, DWI and DSC-PWI

Figure 4



Illustrative case 3, intraoperative quantitative MRA and DSC-PWI