Acute and Follow-up MCA infarct probability maps in stroke patients with MCA occlusion

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Objectives

Here, we investigated infarct growth (localization, pattern) in stroke patients with acute Middle Cerebral Artery (MCA) occlusion, To this aim, we generated stereotaxic MCA infarct *probability* maps using Diffusion-Weighted images (DWI) obtained during the therapeutic window (< 6 hours) and at follow-up in patients with or without MCA arterial recanalization.

Material and Methods

We selected 53 patients (median age: 68 years, range 26-84) with acute MCA stroke and occlusion of the trunk of the MCA (M1) who underwent initial MRI including DWI within the first six hours of stroke onset (median delay of 2.5 hours; IQR: 1.9-3.4 h) and control MRI in the next few days. Recanalization was assessed on the follow-up MR angiography. The T2 weighted images (b0) were normalized to the MNI T2 template and the DW images (b1000) were transformed using the same parameters using SPM5. The acute and follow-up MCA infarct probability maps were created by segmentation and superposition of the normalized DWI hypersignals obtained at the acute stage and at follow-up. In addition, follow-up infarct probability maps were computed in recanalized (n=37) and non-recanalized (n=16) patients, and superimposed to a corticospinal tract (CST) template for interpretation[1].

Results

Figure 1 displays the acute and the final MCA probability maps. Voxels with the highest probability of infarction were localized in the deep white matter of the frontal lobe (x:-26, y: 14, z: 24; probability of infarction=0.71) for the initial map, and in the region of the external capsule and lateral part of the lenticular nucleus for the follow-up map (x: -33, y: -9, z: 6; probability=0.87). Boundaries of our follow-up MCA probability map were visually in good line with those previously described. On the follow-up probability map, the probability of infarction of the **deep** MCA territory and periventricular white matter was much higher in **non recanalized** patients than in recanalized patients, and than on the initial (< 6 hours) infarct probability map. Furthermore, the probability of CST infarction was also much higher in the absence of arterial recanalization. (Figure 2).

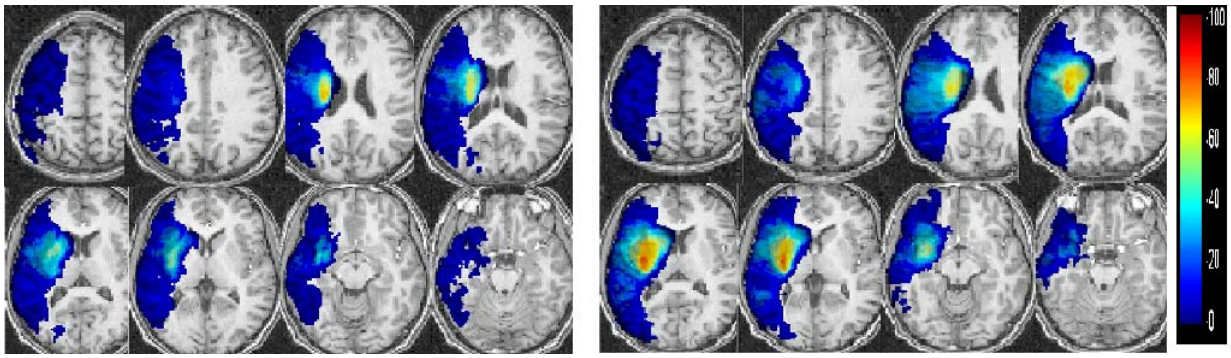

Figure 1. Acute (left) and follow-up (right) probability maps. Color scale indicates the percentage of subjects presenting an infarct for each voxel of the image. Probability of infarction was higher in the deep MCA territory at follow-up than at the acute stage.

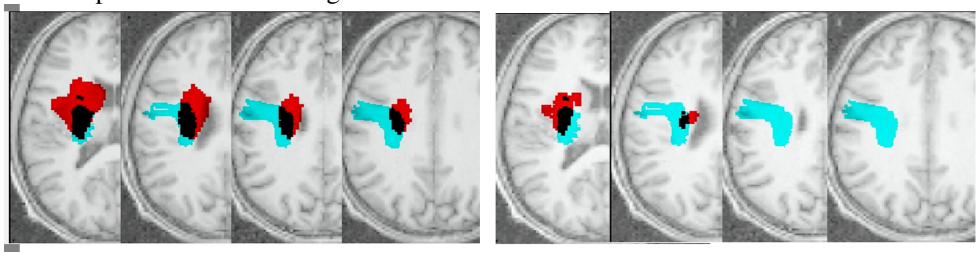

Figure 2. Superposition of the corticospinal tract template (dark) with the 50% probability of infarction in non-recanalized (left) and recanalized (right) patients (in red). Most of the CST was involved in non-recanalized patients whereas it was largely spared in recanalized patients.

Conclusion: In acute stroke patients, MCA arterial recanalization decreased the probability of infarction in the deep MCA territory and the corticospinal tract.

References

1- Bürgel et al, NeuroImage 2006;29:1092-1105.