

Introduction

Ischemic white matter hyperintensities (WMHs) might show dynamic changes over time.[1,2] Fluid-attenuated inversion recovery (FLAIR) T2-MRI is considered as a marker for these lesions.[4] Based on our experience,[2,3] WMHs might improve following sufficient brain revascularization. Herein, a retrospective study was performed to investigate WMHs-course in patients who underwent EC-IC bypass in correlation to the clinical outcome.

Table 1 (Master table)

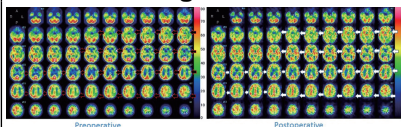
Case number	Age ^a	Sex	CP	Etiology	aeti	L/D	Primary grading of WMH in adult MS		Index of up to 10 WMH in adult MS						Overall number of WMH	
							WMH in WMH		WMH in WMH		WMH in WMH		WMH in WMH			
							WMH	WMH	WMH	WMH	WMH	WMH	WMH	WMH		
1	76	M	Ischaemic stroke	MS (CAG)	1	1	1	1	1	1	1	1	1	1	1	1
2	68	M	MS (CAG)	MS (CAG)	1	1	1	1	1	1	1	1	1	1	1	1
3	68	M	MS (CAG)	MS (CAG)	1	1	1	1	1	1	1	1	1	1	1	1
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97	62	M	MS (CAG)	MS (CAG)	1	1	1	1	1	1	1	1	1	1	1	1
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99	62	M	MS (CAG)	MS (CAG)	1	1	1	1	1	1	1	1	1	1	1	1
100	62	M	MS (CAG)	MS (CAG)	1	1	1	1	1	1	1	1	1	1	1	1

:improvement, :worsening,
=:unchanged, —:no.
Ips.:ipsilateral or
Contr.:contralateral side of the
surgery, PAS:period after
surgery,:mixed improvement,
worsening and appearance of
new WMHs, R:recurrence of the
WMHs, R:mixed improvement
and recurrence or R:mixed
worsening and recurrence of
WMHs, F:fluctuating,
:improvement of PVHs, :
improvement of contralateral
WMHs, :fluctuating PVHs,
:unavailable FLAIR MRI.

Methods

Perioperative FLAIR-MRIs of 12 patients with WMHs, who underwent successful EC-IC bypass surgeries, were enrolled in this study (Table 1). Correlation between WMHs and cerebral blood flow was confirmed by perioperative 123I-iodoamphetamine single photon emission computed tomography (SPECT) and diffusion-weighted image MRI. Sufficient brain revascularizations were confirmed by postoperative SPECT (Fig.1). Following determining the regions of interest (ROI) on a slice-by-slice basis, meticulous volumetric grading and visual assessment of WMHs were done by three experienced raters independently. One of them was blinded to the clinical data. WMHs-course was determined to be improved, fluctuating, worsened or unchanged. Statistical analysis was done. In order to avoid subjective errors, volumetric thresholds for each grade were determined, hyperintensities or changes below 0.25 mL were excluded, scaling evaluation table was designed and the MRI protocol was defined.

Figure 1

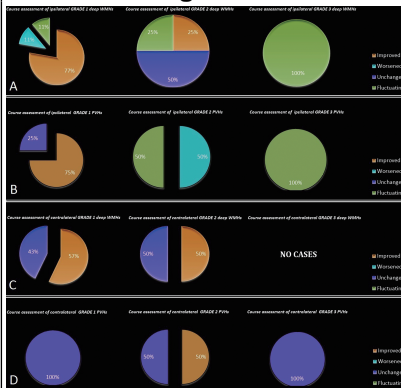


Resting IMP SPECT: assessment of rCBF

Results

WMHs-course over time were: improved (41.7%), fluctuated (33.3%), unchanged (16.7%) or worsened (8.3%). Bilaterally improved-WMH was seen in 80% of patients. Good clinical outcome was not always accompanied with improved WMHs (Fig.2).

Figure 2



The overall course of different grades of WMHs.

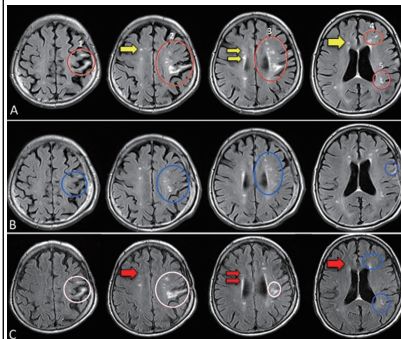
Illustrative case

Bilateral improving course of the WMHs after successful left-sided EC-IC bypass (Fig. 3).

Conclusions

An obvious positive effect of EC-IC bypass on WMHs was documented. However, improved-WMH is not an indispensable prerequisite for good clinical outcome. Despite the presence of some limitations, this study might stimulate future researches to evaluate the reversibility of ischemic WMHs as a marker for sufficient brain revascularization.

Figure 3



WMHs-course on axial FLAIR-MRIs. A: Preoperative; left-sided five ROI (red circles) and right-sided 2 ROI (yellow arrows). B: One week Postoperatively; improvement of the first 3 ROI (blue circles). C: Follow-up "after 6 months"; partial recurrence (white circles) and partial improvement in the last 2 ROI (blue circle) on the left-side, additionally, regression of the right-sided WMHs (red arrows).

Learning Objectives

Improvement of ischemic WMHs could be considered a marker for sufficient brain revascularization.

References

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- 4.Ostwaldt A, Galinovic I, Hotter B, Grittner U, Nolte C, Audebert H, Villringer K, Fiebach J. Relative FLAIR signal intensities over time in acute ischemic stroke: comparison of two methods. J Neuroimaging. 2015; 00:1-5

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