Suspected stroke in a pregnant woman: Usefulness of arterial spin labeling MRI sequences

Suspicion d’infarctus cérébral chez une femme enceinte: intérêt de la séquence ASL

A 30-year-old woman was admitted for acute right homonymous hemianopsia and aphasia. She was 26 weeks pregnant. Her medical history included migraines without aura and rare migraines with typical ophthalmic aura. Since the patient had a sudden weakness, stroke was suspected. Brain MRI, realized one hour after onset of symptoms, revealed no abnormalities on diffusion weighted imaging (DWI) sequences. Since the beginning of symptoms was closed to the MRI realization, arterial spin labelling sequences (ASL) were done and showed large left cortical hypoperfusion, not correlated to an arterial territory. We then hypothesized that the patient had a migraine crisis with aura because of clinical and radiologic discords between the large ASL hypoperfusion not systematized to an arterial brain territory and normal DWI sequences. Two hours after admission, usual headache progressively occurred. Visual and language weakness progressively disappeared four hours after onset. The patient did not recurred.

Discussion

Sudden neurological deficits are a clinical challenge in daily practice and stroke and/or transient ischemic attack is the first diagnosis to evoke. Distinction of ischemic aetiology is primordial among patients with neurological events in order to treat patients as soon as possible, in particular with recent therapies, such as intravenous thrombolysis and/or thrombectomy. Brain MRI is the brain imaging reference when ischemic events are suspected. DWI sequences can disclose recent ischemic signs. However, DWI sequences can be normal and cannot exclude the diagnosis of stroke, especially when realized quickly after weakness onset. ASL sequences have been recently developed to evaluate cerebral perfusion [1]. ASL allows to discriminate stroke from migraine aura, especially when DWI sequences are normal. ASL sequences have many advantages: compared to conventional perfusion techniques, ASL sequences avoid gadolinium injection which is forbidden in case of pregnancy and have a short time duration (about 4 minutes). In our case, ASL sequences were then particularly recommended in our pregnant patient to distinguish migraine from stroke without gadolinium injection.

Most of women suffering from migraine note a significant improvement of their headaches during pregnancy but some of them develop de novo aura migraine [2]. Atypical manifestations are frequent and can mimic transient ischemic attack. However, the rate of stroke appears to increase during pregnancy. Hypercoagulability during pregnancy is a possible explanation for increasing rate of stroke during pregnancy [3].

Brain hypo- and hyperperfusion have been reported during migraines in ASL sequences. These results are easily explained by the pathophysiological mechanisms of migraine and aura. Migraine auras preceding headache are mainly due to a cortical spreading depression (CSD) resulting in waves of back and forth neuronal depolarization and vasoconstriction with decreased brain blood flow. Therefore, during CSD, ASL sequences show characteristic hypoperfusion with posterior predominance not systematized to an arterial territory. Secondly, headache occurring after aura is caused by vasodilatation in response of CSD. Indeed, CSD activates the trigeminal vascular system that leads to a brain vasodilatation. This vasodilatation is expressed by a hyperperfusion in ASL sequences [4]. That is why hypo- and hyperperfusion are described during migraines. We understand that these results are dependent on the completion time of ASL sequences with the pathophysiological phase of the migraine attack.

At last, bilateral thalamic and hypothalamic hypoperfusion have been recently described in ASL sequences during migraine crisis [5]. These results can be explained by the role of hypothalamic neurons in migraine’s genesis. Indeed, hypothalamic neurons project on trigeminal nuclei and may induce migraine attack.

In conclusion, MRI ASL sequences enable to safely and promptly distinguish migraine aura from stroke during pregnancy. These sequences allow better early management of these patients.
Author's contribution

Lou Grangeon: drafting/revising the manuscript, study concept or design, acquisition of data.
Valérie Macaigne: analysis or interpretation of data, acquisition of data.
Ozlem Ozkul-Wermester: drafting/revising the manuscript.
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Figure 1
ASL shows left cortical hypoperfusion, not systematized to an arterial territory and decreased cerebral blood flow

Figure 2
No abnormality on DWI (diffusion weighted imaging)

References