Teaching *NeuroImages*: Usefulness of susceptibility-weighted sequences after traumatic brain injury

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Figure Brain MRI

Extensive microhemorrhage compatible with diffuse axonal injuries along the brainstem, thalami, corpus callosum, and frontal and temporal lobes, which are not visible with classic T2*-weighted gradient-echo sequence (A) but only with susceptibility-weighted MRI (B; arrows).

Three weeks after severe traumatic brain injury (pedestrian hit by a car) and correction of initial intracranial hypertension, a brain MRI is performed in a 22-year-old woman, who remains in a comatose state (Glasgow Coma Scale at 4, with withdrawal to painful stimuli; abolition of photomotor reflex; persistence of corneal and cough reflexes). Fluid-attenuated inversion recovery and

T2*-weighted gradient-echo sequences reveal subtle hyperintensities within the brainstem. On susceptibility-weighted imaging, extensive diffuse axonal injuries are identified in the brainstem, thalami, corpus callosum, and frontal lobes, which explain the clinical state (figure).

Susceptibility-weighted imaging is a gradient-echo sequence combining phase and magnitude information,

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highly sensitive in the detection of magnetic field variation, especially generated by hemoglobin degradation products.¹ It is more accurate in the detection of diffuse axonal injuries after brain injury, which is mandatory, as their presence is correlated to functional and cognitive prognosis.²

AUTHOR CONTRIBUTIONS

Thomas Ritzenthaler: drafting/revising the manuscript, analysis or interpretation of data, accepts responsibility for conduct of research and will give final approval, acquisition of data, study supervision. Leila Chamard: analysis or interpretation of data, accepts responsibility for conduct of research and will give final approval, acquisition of data. Frédéric Dailler: drafting/revising the manuscript, accepts responsibility for conduct of research and will give final approval, study supervision.

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