Trouble de Stress Post-Traumatique: Traitement par stimulation magnétique transcrânienne
Prefrontal cortex rTMS reverses behavioral impairments and differentially activates c-Fos in a mouse model of post-traumatic stress disorder

Abstract

Background - Post-traumatic stress disorder (PTSD) is a severe mental illness correlated with alterations in fear extinction neurocircuits that involve prefrontal, amygdala and hippocampal structures. Current treatments indirectly restore prefrontal control of fear responses, but still cannot achieve full remission in all patients.

Objectives/hypothesis - Repetitive TMS (rTMS) can directly and chronically act on subparts of the prefrontal cortex (PFC) as a potential alternative treatment. However, preclinical studies are needed to further the comprehension of its mechanisms and thus enhance its efficacy.

Methods - A 40-mm coil is used on a stereotaxic frame to apply 12-Hz high-intensity rTMS of the ventromedial PFC (vmPFC) in a foot-shock mouse model of PTSD. Chronic rTMS treatment was applied 7 days after the shocks every day up to day 12 (5 sessions, 3750 pulses).

Results - One session of rTMS (750 pulses) was able to precisely evoke immediate c-Fos activity in an area of the vmPFC (0.5mm2) in preliminary control mice. When used in the foot-shock model, chronic rTMS treatment (n=19) counteracted short-term episodic memory deficits at day 18, and enhanced extinction dynamics when reexposed to the shocking chamber at day 22. Associated c-Fos activity was found increased in the rodent's vmPFC (infralimbic cortex), the basolateral amygdala and the ventral CA1 (hippocampal output).
Conclusions - This study is the first to use prefrontal cortex rTMS in a mouse model of PTSD. Chronic rTMS of the vmPFC reversed stress-induced behavioral impairments and acted on distributed networks of fear extinction up to 10 days after treatment.

Keywords
Basolateral amygdala; CA1; Infralimbic cortex; Post-traumatic stress disorder; rTMS; vmPFC.

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