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The feasibility of utilizing a low-intensity focused 3d ultrasound (lifu) system as a model for non-invasive targeting, stimulation and tracking of GABAergic neurons in the treatment of Tourette's Syndrome

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Current methods for brain stimulation, such as deep brain stimulation (DBS), rely on invasive procedures, which can put patients at risk for post-surgical complications such as infection. As such, utilizing a 3D low-intensity focused ultrasound (LIFU) system allows for the efficient and non-invasive stimulation of neurons, effectively eliminating any risk of surgical-related complications. It may even be possible that such an ultrasound system utilizes LIFU for identifying a key target location to receive stimulation while continuously tracking its position based on identifiable structural fiducials for feedback, thus allowing for precise stimulation and optimal treatment outcomes. This review will attempt to assess the feasibility of such application of ultrasound technology for future treatment of Tourette's syndrome. Based on the current literature presented in this review, several target locations for DBS treatment of Tourette's syndrome have been identified, but one location appears to be optimal for stimulation: the globus pallidus internus. This region of the brain is rich in neurons producing the common inhibitory neurotransmitter gamma amino-butyric acid (GABA), a neurochemical thought to play a crucial role in Tourette's syndrome. It is believed that by stimulating this area this will alleviate the symptoms associated with tourette's syndrome (i.e. vocal and motor 'tics'); this review proposes that stimulation of this region can be achieved with LIFU.

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