

Procedure-related pain in MRgFUS for the treatment of tremor in PD and ET patients

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Introduction: Magnetic resonance-guided focused ultrasound (MRgFUS) targeting the ventral intermediate nucleus of the thalamus (Vim) is an effective treatment for medically refractory tremor in patients with essential tremor (ET) and tremor-dominant Parkinson's disease (PD). MRgFUS is an awake procedure in which the patient's cooperation with the clinician is pivotal for the treatment outcome. Pain during sonication and frame positioning are among the more frequent transient adverse events of the MRgFUS procedure. Pain can become so severe that the ablation has to be stopped prematurely, leading to incomplete ablation and reducing the effectiveness of the treatment.

Objective: The study aimed to investigate pain perception during the MRgFUS procedure and to identify factors that affect it.

Methods: Consecutive patients with ET and PD treated with unilateral MRgFUS of the Vim were enrolled. Pain perception during sonication and frame positioning was assessed using a visual analog scale (VAS) within one month of the surgery. Between-group and correlational analyses were performed.

Results: A total of 73 patients (34 PD and 39 ET) were enrolled. One-third (33%) of patients experienced "strong" to "heartbreaking" pain during sonication and 47% during frame positioning. There was no difference in pain intensity during MRgFUS depending on gender, side of the lesion, or disease. The perception of pain showed the strongest correlation with the skull density ratio (SDR) and significant correlations with the peak of the temperature, treatment duration, and pain during helmet placement. The number of sonications, the peak of the power (Watt), the cranial surface, mood symptoms, and anxiety symptoms before surgery were unrelated.

Conclusions: SDR is the main factor influencing pain intensity perception. During MRgFUS, attention must be paid to pain management, particularly for patients with low SDR scores.