Intraprocedural Target Conversion from Pallidotomy to Pallidothalamic Tractotomy for Improving Thermal Efficiency in MR-Guided Focused Ultrasound for Parkinson's Disease

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Abstract

Introduction: Magnetic Resonance-guided Focused Ultrasound (MRgFUS) pallidotomy (GPi) is an established treatment for Parkinson's disease (PD). However, challenges like low-thermal efficiency, particularly due to skull density variations or off-midline target locations, can hinder effective lesioning. This report presents 3 cases of intraprocedural conversion from GPi pallidotomy to pallidothalamic tract (PTT) ablation due to inadequate thermal build-up. In all, the possibility of conversion was informed and consented by the patient previous to the procedure.

Method: Case 1: A 49-year-old male with non-tremor PD and dyskinesias underwent left GPi MRgFUS. Despite optimal targeting, thermal mapping indicated insufficient temperature increase (max 48 °C). An immediate intraprocedural shift to PTT targeting resulted in a successful lesion and significant clinical improvement. Case 2: A 57-year-old female with PD and severe dyskinesia presented for left GPi MRgFUS. Initial sonications yielded suboptimal thermal profiles. Recognizing this low thermal efficiency, the target was redirected to the PTT. This conversion facilitated adequate thermal ablation, leading to marked improvement in rigidity, bradykinesia, and dyskinesias with no significant adverse events. Case 3: A 66-year-old male with asymmetrical PD and dyskinesias underwent left MRgFUS Pallidotomy, in whom low thermal response at the GPi (max 49°C) required intraprocedural redirection to PTT, achieving effective lesioning and symptomatic improvement.

Discussion: These cases highlight non-invasive intraprocedural adaptability as a crucial strategy when encountering low-thermal efficiency during MRgFUS pallidotomy, allowing for effective treatment by converting to PTT ablation. This approach expands the therapeutic window for patients with challenging anatomical or thermal profiles.

Conclusions: Magnetic Resonance-guided Focused Ultrasound (MRgFUS) allows intraoperative redefinition of a new target whithout increasing risk.

References

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