

Simultaneous Unilateral MR-Guided Focused Ultrasound Pallidotomy and Thalamotomy for Severe and Tremulous Asymmetric Parkinson's Disease

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Abstract

Introduction: Magnetic resonance-guided focused ultrasound (MRgFUS) has emerged as a minimally invasive therapeutic approach for movement disorders. A combined targeting approach involving the globus pallidus internus (GPi) and the ventral intermediate nucleus of the thalamus (Vim) in a single unilateral procedure may offer broader symptom control in Parkinson's disease (PD) patients presenting with mixed motor symptoms, such as dyskinesia (DK) and tremor.

Clinical description: We evaluated 7 patients with severe asymmetric Parkinson's disease presenting with both dyskinesia and severe tremor who underwent unilateral MRgFUS lesioning of the globus pallidus internus (GPi) and the ventral intermediate nucleus of the thalamus (Vim) during the same treatment session. Motor function was assessed using the Unified Parkinson's Disease Rating Scale, part III (UPDRS-III), before and after the intervention. Dyskinesia status (absent, present, or partially improved), UPDRS-IV scores, daily levodopa-equivalent dose (LED), and subjective perception of benefit were recorded during follow-up. The mean age was 67.4 ± 6.4 years, with a mean disease duration of 11.7 ± 4.7 years. The mean follow-up period was 3.4 ± 2.6 months (range 1–8). Baseline UPDRS-III scores averaged 49.6 ± 11.0 , improving to 31.3 ± 10.3 , corresponding to a 34.3% improvement ($p < 0.05$, Wilcoxon test). Mean UPDRS-IV scores improved from 9.0 ± 3.6 to 5.4 ± 1.9 . The daily LED decreased from 802.1 ± 302.8 mg to 676.5 ± 250.1 mg. One patient developed a mild, transient lower limb paresis. No other major complications were observed during the follow-up period.

Discussion: Unilateral MRgFUS lesioning of GPi+Vim yielded meaningful motor improvements and high patient-reported benefit rates in a short-term follow-up, with a reduction in both tremor and dyskinesia severity. These findings support the rationale for a combined target approach in selected PD patients, particularly those with disabling mixed motor features. The degree of UPDRS improvement is consistent with reported outcomes of single-target lesioning, suggesting that dual-target therapy may offer broader symptomatic coverage without a proportional increase in adverse events.

Conclusions: In this small case series, unilateral MRgFUS GPi+Vim lesioning was associated with significant motor improvement and reduction in dyskinesia. Longer-term studies with larger cohorts are warranted to confirm durability, refine patient selection, and optimize targeting strategies.

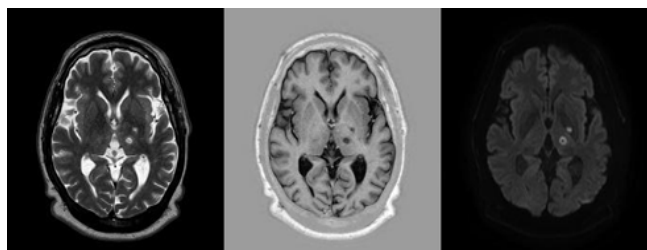


Figure 1. A combined targeting approach involving the globus pallidus internus (GPi) and the ventral intermediate nucleus of the thalamus (Vim) in a single unilateral procedure.

References

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