

Sequential Subthalamotomy and Thalamotomy Using MR-Guided Focused Ultrasound in Parkinson's Disease: A Rare Case of Multitarget Lesioning for Mixed Motor Symptoms

WSSFN 2025 Interim Meeting. Abstract 0093.

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How to Cite: Rivera F, Quintanal Cordero NE, Pampin S, Barbosa N, Etcheverry JL, Vaisenstein GE, et al. Sequential Subthalamotomy and Thalamotomy Using MR-Guided Focused Ultrasound in Parkinson's Disease: A Rare Case of Multitarget Lesioning For Mixed Motor Symptoms: WSSFN 2025 Interim Meeting. Abstract 0093. NeuroTarget. 2025;19(2):66-7.

Abstract

Introduction: MR-guided focused ultrasound (MRgFUS) is a non-invasive therapeutic modality increasingly used for the treatment of movement disorders. While most interventions target a single nucleus, such as the ventral intermediate nucleus (VIM) or the subthalamic nucleus (STN), cases with mixed motor symptoms, such as tremor and bradykinesia, may require a more tailored approach. Multitarget MRgFUS remains rarely reported.

Method: A 70-year-old right-handed male with an 8-year history of idiopathic Parkinson's disease presented with right-predominant upper extremity and cephalic tremor, associated with significant bradykinesia and rigidity, refractory to optimized dopaminergic therapy. Preoperative neuropsychiatric evaluation confirmed candidacy for MRgFUS. Patient consent was obtained to share this information. Initial lesioning targeted the left STN using 3T MRI and CT fusion imaging. The anatomical coordinates were X=11.5, Y=10.2, Z=-4 mm, relative to PC. Stepwise sonications at 54–56°C were performed based on intraoperative clinical response. Significant improvement in bradykinesia and rigidity was observed, but residual tremor persisted. Subsequently, a left VIM thalamotomy was performed at coordinates X=14, Y=6.4, Z=2 mm, using a single sonication at 54°C for 6s. The STN lesioning resulted in marked improvement in contralateral bradykinesia and rigidity without adverse effects. However, tremor suppression was incomplete. Following the VIM lesion, complete resolution of tremor was achieved. The procedure was well tolerated, with no intraoperative complications. At one-month follow-up, the patient maintained sustained improvement in bradykinesia and rigidity, with complete tremor control. Mild right-sided ataxia was noted but did not interfere with daily functioning. Levodopa dosing

was reduced, and no cognitive or psychiatric side effects were reported.

Discussion: This case illustrates the feasibility and safety of multitarget lesioning -STN followed by VIM- in a single session. The approach enabled tailored symptom relief, reinforcing the value of intraoperative adaptability and expanding the potential role of MRgFUS in complex functional neurosurgery.

Conclusions: In patients with Parkinson's disease and refractory mixed motor phenotypes, single-target MRgFUS may provide limited relief. Thus, our sequential single-session approach may improve both symptom control and procedural efficiency, leading to substantial patient benefit.

References

1. Fukutome K, Kuga Y, Ohnishi H, Hirabayashi H, Nakase H. What factors impact the clinical outcome of magnetic resonance imaging-guided focused ultrasound thalamotomy for essential tremor? *J Neurosurg*. 2020;134(5):1618-1623. doi: 10.3171/2020.2.JNS192814. PMID: 32357330.
2. Segar DJ, Lak AM, Lee S, Harary M, Chavakula V, Lauro P, et al. Lesion location and lesion creation affect outcomes after focused ultrasound thalamotomy. *Brain*. 2021;144(10):3089-3100. doi: 10.1093/brain/awab176. PMID: 34750621.
3. Arcadi A, Aviles-Olmos I, Gonzalez-Quarante LH, Gorospe A, Jiménez-Huete A, de la Corte MM, et al. Magnetic Resonance-Guided Focused Ultrasound (MRgFUS)-Thalamotomy for Essential Tremor: Lesion Location and Clinical Outcomes. *Mov Disord*.

- 2024;39(6):1015-1025. doi: 10.1002/mds.29801. Epub 2024 Apr 14. PMID: 38616324.
4. Gallay MN, Moser D, Federau C, Jeanmonod D. Radiological and Thermal Dose Correlations in Pallidothalamic Tractotomy With MRgFUS. *Front Surg.* 2019;6:28. doi: 10.3389/fsurg.2019.00028. PMID: 31157233; PMCID: PMC6533852.
5. Cesarano S, Pistoia F, Catalucci A, et al. Staged magnetic resonance-guided focused ultrasound thalamotomy for the treatment of bilateral essential tremor and Parkinson's disease related tremor: a systematic review and critical appraisal of current knowledge. *Front Neurol.* 2024;20:151409727. doi: 10.3389/fneur.2024.1409727. eCollection.
6. Tian X, Hu R, He P, Ye J. Efficacy and safety of magnetic resonance-guided focused ultrasound for Parkinson's disease: a systematic review and meta-analysis. *Front Neurol.* 2023;14:1301240. doi: 10.3389/fneur.2023.1301240. PMID: 38146437; PMCID: PMC10749343.