

Unilateral MR-Guided Focused Ultrasound Subthalamotomy in Parkinson's Disease: Outcomes of 70 Consecutive Cases

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Abstract

Introduction: Magnetic resonance-guided focused ultrasound (MRgFUS) unilateral subthalamotomy is an emerging non-invasive lesioning modality for Parkinson's disease (PD), targeting the subthalamic nucleus (STN) to improve motor performance and reduce dopaminergic medication requirements, thereby potentially mitigating long-term treatment complications.

Method: We evaluated 70 consecutive PD patients who underwent MRgFUS unilateral subthalamotomy, with at least 3 months of follow-up. Variables assessed included age, disease duration, follow-up period, sex distribution, and post-procedural dyskinesia incidence. Primary endpoints were changes in levodopa equivalent daily dose (LEDD) and Unified Parkinson's Disease Rating Scale part III (UPDRS-III) scores in the OFF-medication state, from baseline to last follow-up. Paired t-tests were applied, with significance set at $p < 0.05$.

Results: The cohort comprised 50 men and 20 women, with a mean age of 59.8 years (range, 33 to 79 years), a mean PD duration of 7.2 years (range, 2 to 16 years), and a mean follow-up of 6.3 months (range, 3 to 30 months). Mean LEDD decreased from 754.8 ± 495.8 mg to 575.0 ± 380.3 mg ($p < 0.05$), while UPDRS-III OFF scores improved from 42.8 ± 9.2 to 26.5 ± 7.8 ($p < 0.001$). Post-procedural dyskinesias were reported in 14.7% of cases, predominantly mild and self-limiting. Transient adverse events such as gait disturbance, dysarthria, paresis, dystonia/dyskinesia were generally minor and resolved spontaneously in most instances. Adverse effects at the last follow-up were mild or moderate in 6 patients (8.5%). No procedure-related mortality, infections, or severe complications were observed.

Discussion: In this large consecutive series, MRgFUS uni-

lateral subthalamotomy demonstrated statistically and clinically significant improvements in both motor function and medication burden at short-term follow-up. The low incidence of mild, transient dyskinesias reinforces its safety profile. These findings are consistent with previous controlled trials and pilot studies, extending the evidence base for STN lesioning in PD. Limitations include the retrospective design, absence of a control arm, and relatively short follow-up; prospective, randomized studies are warranted to confirm efficacy and long-term durability.

Conclusions: MRgFUS unilateral subthalamotomy is an effective intervention for advanced PD, yielding meaningful motor improvement and reduced medication dependency, without significant permanent adverse effects.

References

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