

Validation of the ReBrain AI Algorithm for Pre-Operative Targeting of the ViM

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Background

MRgFUS is an incisionless therapy for medication-resistant ET and tremor-dominant PD. Targeting often uses stereotactic coordinates with awake testing, yet gait disturbances remain common, especially with deeper lesions. DTI has been explored but no patient-specific standard exists. ReBrain AI predicts lesion targets and correlates with imbalance risk.

Objective

Assess the ReBrain AI algorithm for predicting ViM lesion sites associated with tremor improvement and its correlation with gait disturbances.

Methods

Retrospective review of 161 ET and tremor-dominant PD patients treated with MRgFUS ViM ablation over 5 years. Excluded: missing tremor scores or gait data.

MRI data from 50 patients analyzed with ReBrain AI.

Analyses:

- Z-axis correlation of predicted vs. actual lesion site.
- Multidirectional lesion location vs. gait disturbance.

Results

- Deeper lesions associated with higher risk of gait disturbance.
- Correlation coefficient = 0.36.
- Multi-axis analysis: inferior and lateral lesions associated with higher gait disturbance risk.
- Maximal correlation at direction (0.45, 0, -0.89).

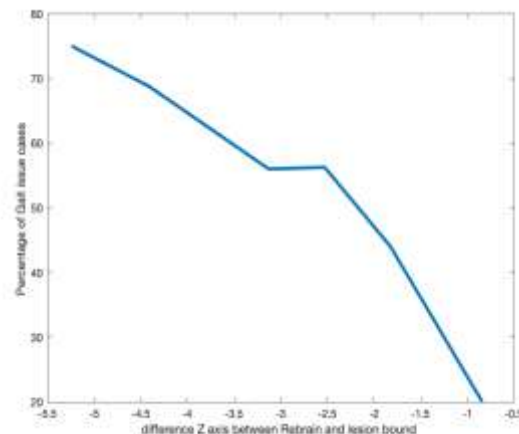


Figure 1 : Correlation between distance to inferior pole of lesion - ReBrain prediction and occurrence of gait disorder

Correlation with imbalance indicator w.r.t to lesion extent in all directions

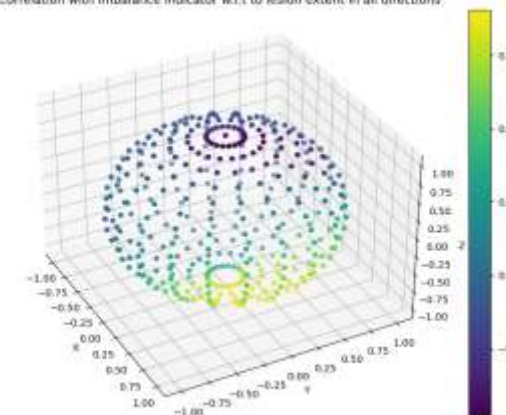


Figure 2 : Multidimensional correlation between the position of the lesion boundaries and the onset of a gait disorder (the deeper and more anterior the lesion, the stronger the correlation).

Conclusion

ReBrain AI correlates lesion location with gait disturbance risk in MRgFUS tremor patients. Inferior/lateral lesions increase risk, supporting AI-guided patient-specific targeting to reduce adverse effects.