

Introduction

MR-guided focused ultrasound (MRgFUS) is a new way to perform thalamotomy for essential tremor (ET). It is unknown whether ultrasound-based thalamic mapping can help with targeting, or how lesion size and placement will affect tremor and side effects. Therefore with this prospective trial of MRgFUS thalamotomy, we AIM to optimize targeting, lesion size, and location.

Methods

Patients, diagnosed with ET by a movement disorder neurologist, who have failed medications and pass neuropsychology and CT screening are enrolled. Assessments consisting of accelerometry, Clinical Rating Scale for Tremor (CRST), ataxia scale, Purdue pegboard, depression, and quality of life scales are performed pre, post- at month 3 and yearly thereafter. MRI is performed at these time points, as well as on day 1 post-op. Initially we used the targeting suggested by the manufacturer, based on atlas Vim, 14 mm lateral to midline on the AC-PC line. We are recently trying lower temperature verification methods to map somatosensory thalamus before moving to the lesioning target.

Results

Nine patients (8 M, 1 F) have had MRgFUS thalamotomy (2 R, 7 L). The number of sonications ranged from 13-24. All patients experienced “flipping backwards” during sonications that improved tremor. In 3 of 5 patients where we performed sonications 2-4 mm posterior to target, we observed face paresthesia. Five have reached 3-month follow-up and have 27-93% improvements in CRST. Average lesion volumes at day 1 (from T1 and SWAN images) ranged from 159-478 mm³ and were unrelated to tremor outcome. Adverse effects included feeling off balance, contralateral clumsiness, taste changes, numbness in the hand or mouth, and in one patient the emergence of myoclonus.

Conclusions

Our early results are similar to those reported in larger series. Ongoing research will determine the relationship of lesions to brain atlases, use pre-operative tractography, and test neuromodulatory sonications to tailor targeting in each patient.

Learning Objectives

Learn methods and results of thalamotomy using this new technology

Learn about research imaging being used to study this procedures

References