# A Novel Mesial Temporal Stereotactic Coordinate System

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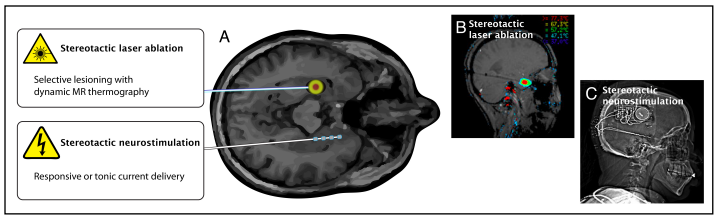
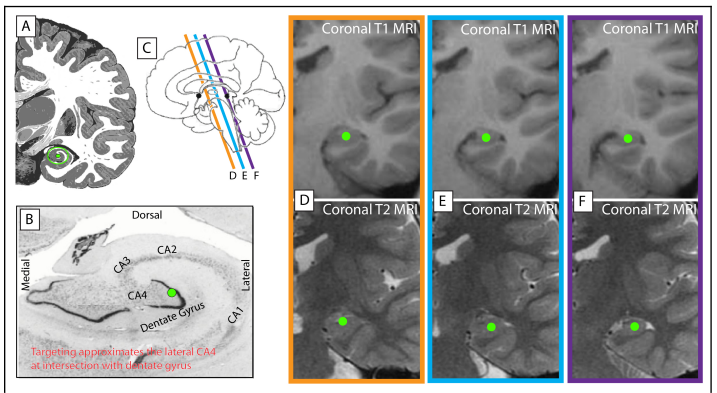
https://purl.stanford.edu/zk881ps0522

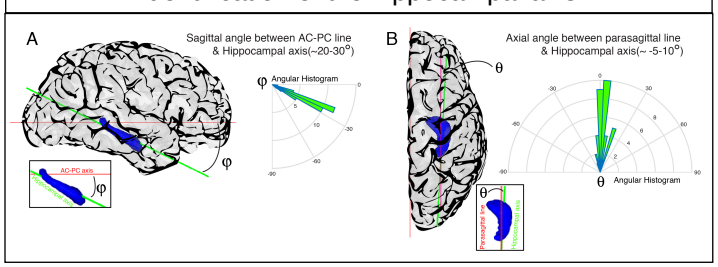
**Introduction:** Stereotactic laser ablation and neurostimulator placement represent an evolution in staged surgical intervention for epilepsy. As practice evolves, optimal targeting will require standardized outcome measures that compare electrode lead or laser source with post-procedural changes in seizure frequency. We propose and present a novel stereotactic coordinate system based upon mesial temporal anatomic landmarks to facilitate the planning and delineation of outcomes based on extent of ablation or region of stimulation within mesial temporal structures.

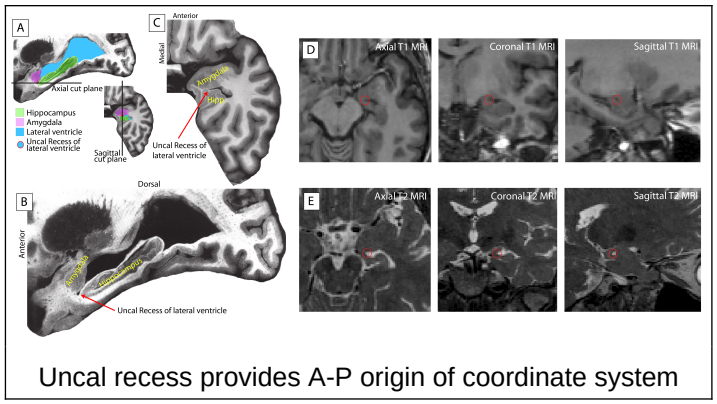



**Methods:** The body of the hippocampus contains a natural axis, approximated by the interface of CA4 and the dentate gyrus. The uncal recess of the lateral ventricle acts as a landmark to characterize anterior-posterior extent. Several volumetric rotations are quantified for alignment with the hippocampal coordinate system. First, the brain volume is rotated to align with standard AC-PC space. Then, it is rotated through the axial and sagittal angles the hippocampal-axis makes with the AC/PC-line.




Identification of the hippocampal axis

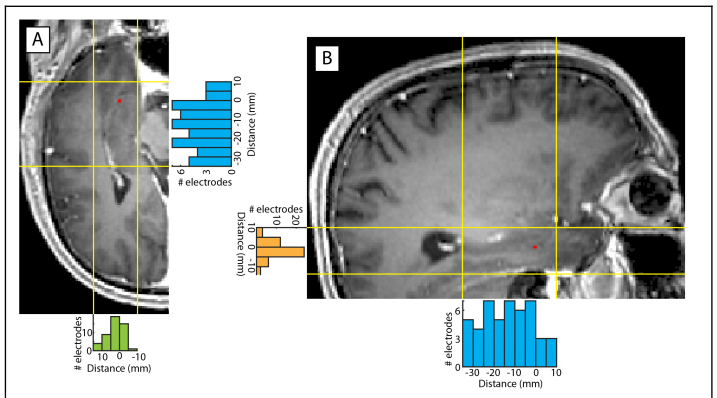



Uncal recess provides A-P origin of coordinate system

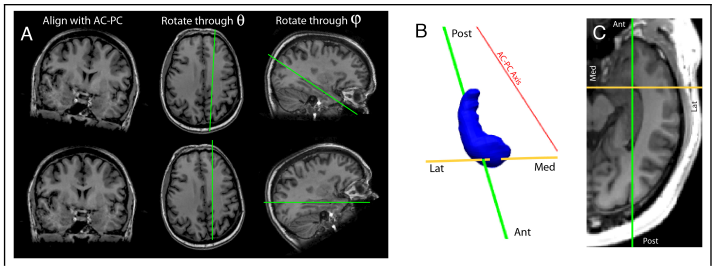
**Results:** Using this coordinate system, customized MATLAB software was developed to allow for intuitive standardization of targeting and interpretation. The angle between the AC/PC-line and the hippocampal-axis was found to be ~20-30° when viewed sagittally and of order ~-5-10° when viewed axially. Implanted electrodes can then be identified from CT in this space, and laser tip position and burn geometry can be calculated based on the intraoperative and post-operative MRI.

**Conclusions:** With the advent of stereotactic surgery for mesial temporal targets, a hippocampal stereotactic system is introduced which may facilitate operative planning, improve surgical outcomes, and standardize outcome assessment.

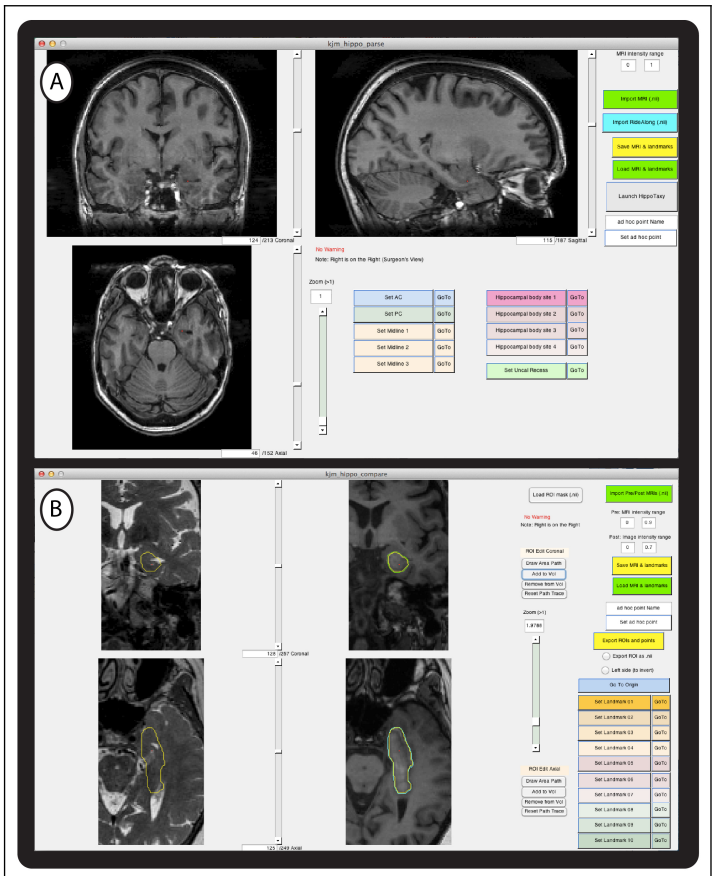



One group's RNS lead placement distribution

**Reference:** Miller, K.J., Halpern, C.H., Sedrak, M.F., Duncan III, J.A. and Grant, G.A., 2018. A novel mesial temporal stereotactic coordinate system. Journal of neurosurgery, *epub ahead of print*




Steps to realign to coordinate space.




"Hippotaxy" Software programs, available at:
https://purl.stanford.edu/zk881ps0522