Pre-Operative MRI and EEG Features Predict Post-Surgical Epilepsy Prognosis and Recurrence

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Introduction:

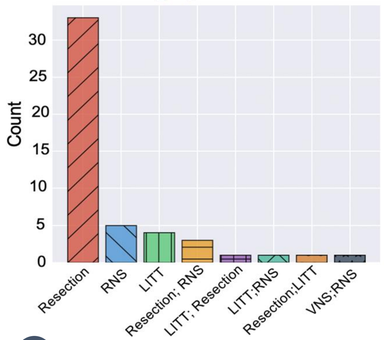
Epilepsy is characterized by abnormal neural activity resulting in seizures, managed commonly by anti-seizure medications (ASMs). Intractable epilepsy, defined by failure of two or more ASMs, qualifies patients for surgery. However, many continue to experience seizures post-operatively, with some requiring repeat surgery. This study examines whether pre-operative MRI findings can predict long-term surgical prognosis and recurrence

Methods:

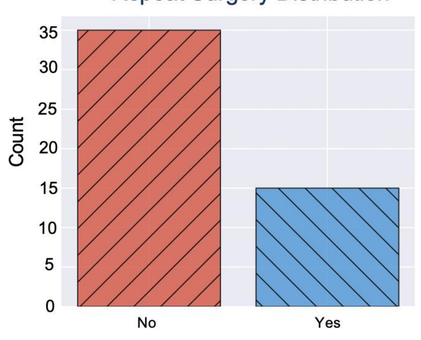
- Random subset of data collected from n=50 patients retrospectively 2013-2020
  - Extracted Surgical Conference Notes, Surgical Notes, and Clinic Notes 1, 2, 5 years post-first surgery
  - Extracted Medical Record Numbers, Raw MRI report, raw EEG report, First Surgery, First Surgery date, Surgery Success/Failure, Engel Score 1, 2, 5 years post-surgery
  - Categorized raw MRI Reports into normal/abnormal, lesion location, category, and laterality
  - Categorized raw EEG reports
- Data analysis
  - Categorized Engel outcomes by MRI lesion location, category, and laterality
  - Categorized Engel outcomes by EEG findings
  - Utilized Natural Language Processing to compare most common words used in the raw MRI reports between patients with repeat surgeries vs no repeat surgery

Results:

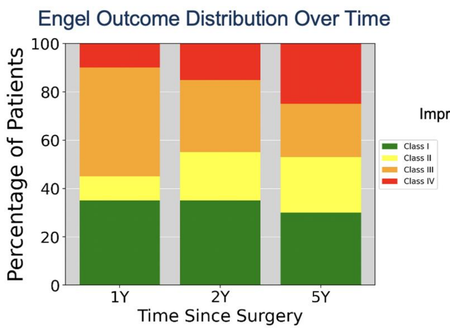
1 Resection is the most common surgery

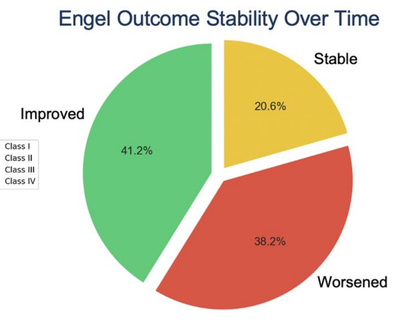


2 Repeat surgeries are often required



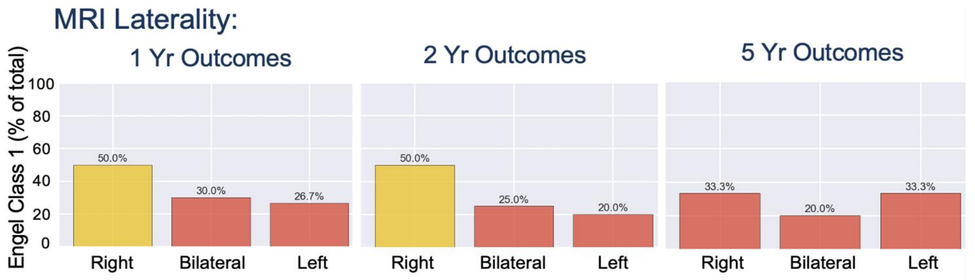
3 Seizures tend to return after surgery



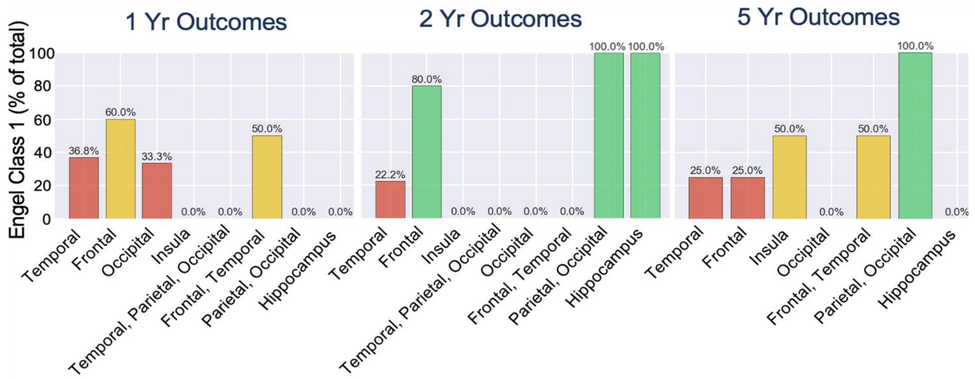


Results:

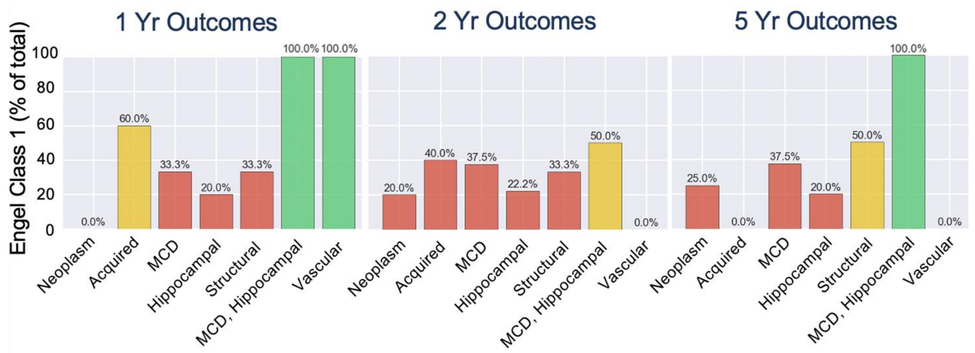
4 Slightly Better for Right TLE



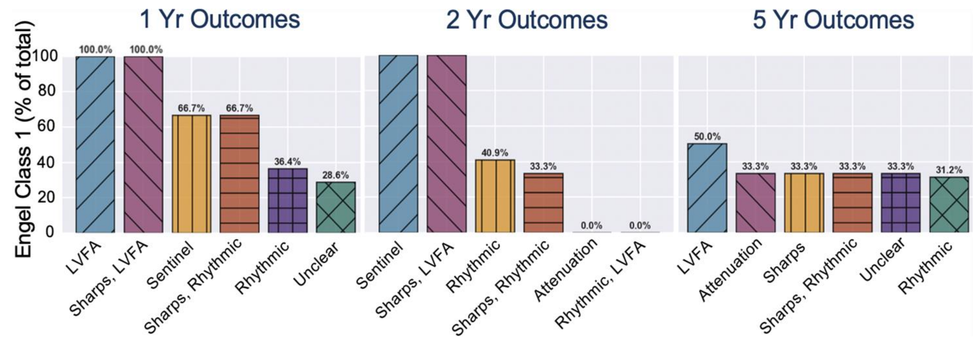
5 Lesion Location not consistent over time



6 Lesion Category not consistent over time

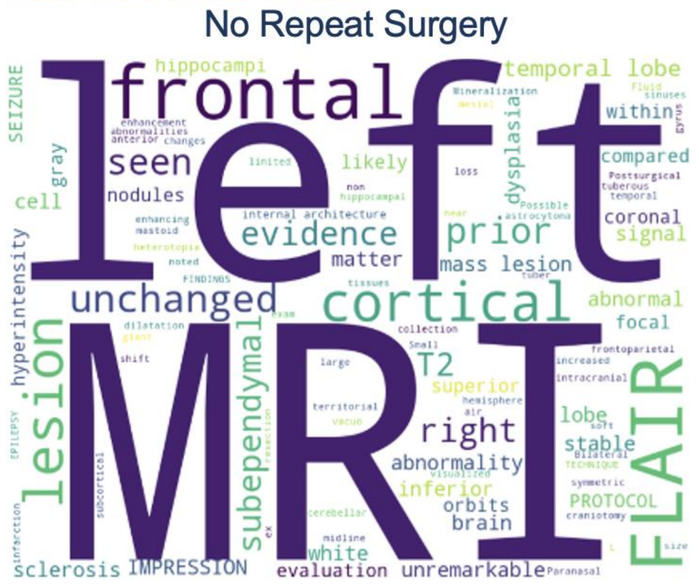


7 Different EEG seizure patterns have different surgical outcomes



8 Normal MRIs Require Repeat Surgery

Raw MRI Word Cloud:



Conclusions:

- Manually categorized EEG and MRI features show prognostic value and align with clinical patterns
- This lays groundwork for future machine learning based prediction models to guide therapeutic strategies.

Acknowledgements:

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