

Coregistration of multimodal imaging is associated with favourable two-year seizure outcome after paediatric epilepsy surgery*

Michael Scott Perry¹, Laurie Bailey¹, Daniel Freedman²,
David Donahue¹, Saleem Malik¹, Hayden Head¹,
Cynthia Keator¹, Angel Hernandez¹

¹ The Jane and John Justin Neuroscience Center, Comprehensive Epilepsy Program,
Cook Children's Medical Center, Fort Worth, Texas

² University of North Texas College of Osteopathic Medicine, Fort Worth, Texas, USA

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- Multimodal coregistered neuroimaging uses multiple image datasets coregistered to an anatomical reference (*i.e.* MRI) allowing multiple studies to be viewed together.
- Commonly used in intractable epilepsy evaluation and generally accepted to improve localization of the epileptogenic zone, data showing that coregistration improves outcome is lacking.
- We compared seizure freedom following epilepsy surgery in paediatric patients, evaluated before and after the use of coregistration protocols, at our centre to determine whether this correlated with a change in outcome.
- 115 patients were included (average age 10.6y, range 0.12-20.7) in the final cohort. Sixty-eight (59%) had coregistration of imaging.
- All evaluations included video-EEG (VEEG) and MRI. Seven (6%) had subtraction single-photon emission CT (SPECT), 46 (40%) had positron emission tomography (PET), and 62 (54%) had both as part of their evaluation. Sixty (52%) had extratemporal epilepsy and 25 (22%) were MRI-negative.

- The pre- and post-multimodal imaging cohorts were similarly matched, though the coregistration cohort had fewer MRI-negative patients and underwent more functional imaging studies.
- To adjust for effect of confounding variables on the impact of coregistration, propensity scores were estimated based on age at onset, seizure duration, AED exposure, number of seizure types, EEG results (focal versus multifocal), seizure frequency, MRI magnet (1.5T vs 3T), MRI lesional status, type and number of imaging studies, stage of surgery (1 vs 2-stage), and type of resection, and then evaluated in a binary logistic regression with treatment group predicting outcome at 1 and 2 years.
- Patients evaluated with multimodal coregistration were less likely to undergo invasive EEG monitoring ($p=0.045$) and were more likely to experience favourable seizure control at two years ($p<0.001$) post-operatively.
- Coregistration of neuroimaging data should be **considered as a routine** component of presurgical evaluation for children with intractable epilepsy.