

Clinical Accuracy of Customized Stereotactic Fixtures for Stereo-EEG

Hong Yu¹, Constantin Pistol³, Ronald Franklin², *Andrei Barborica^{2,3}

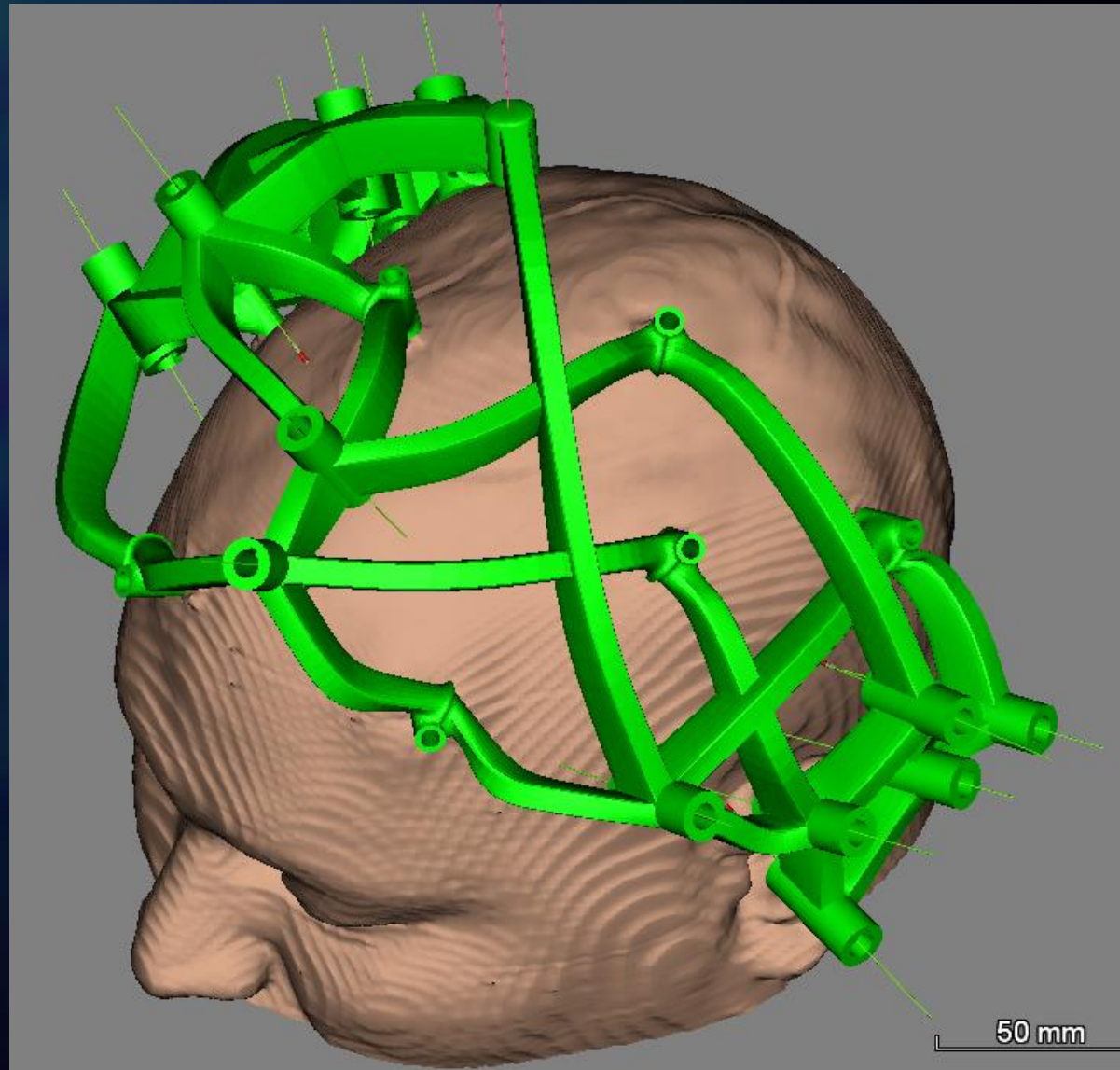
¹ Department of Neurosurgery, Vanderbilt University, Nashville, TN

² FHC Inc, Bowdoin, ME

³ Physics Department, Bucharest University, Bucharest, Romania

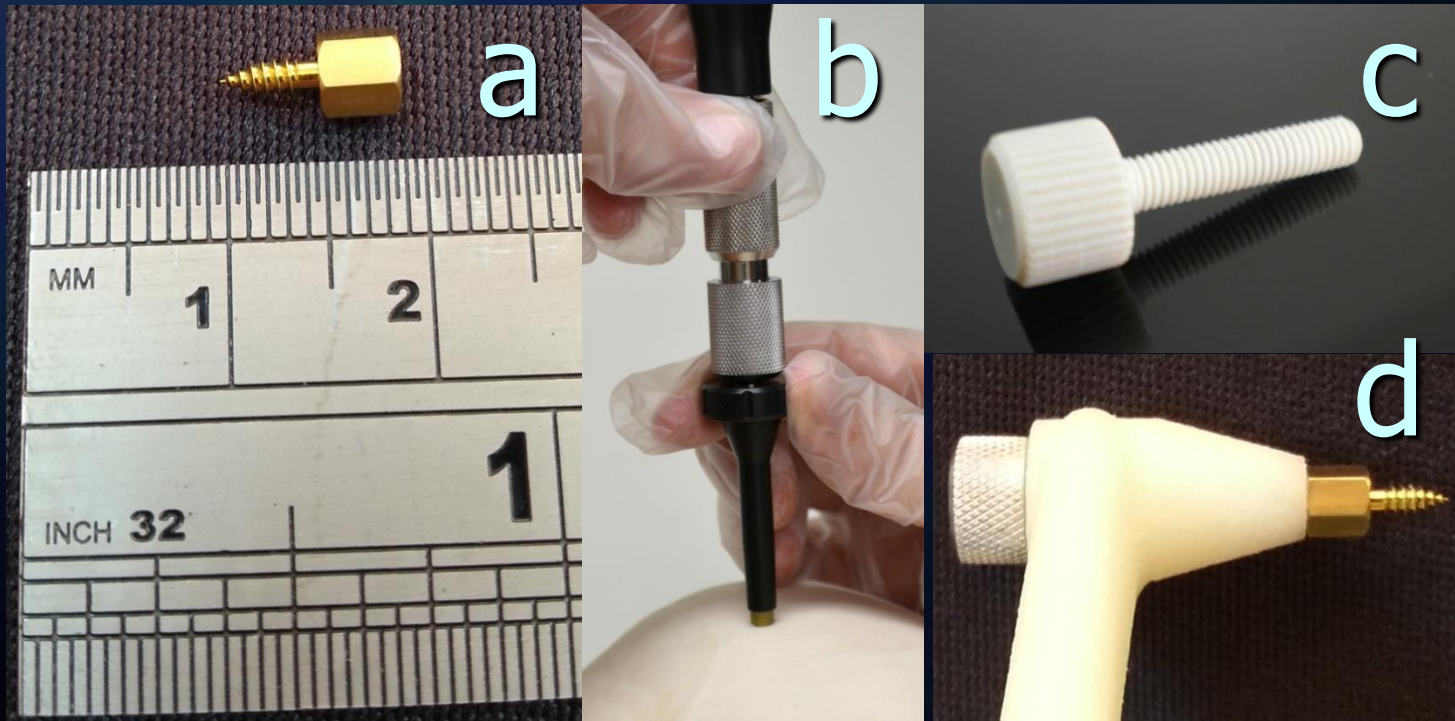
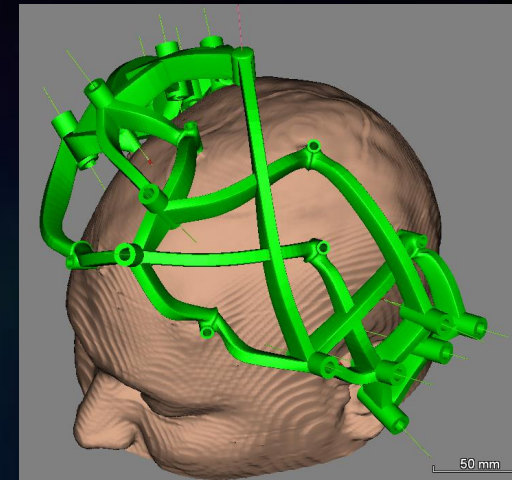
Patient-customized stereotactic fixtures for SEEG

- Computer-generated model, 3D printed
- Incorporates all trajectories in a single device
- Can reach any part of the brain
- No moving parts
- Appropriate for pediatric applications



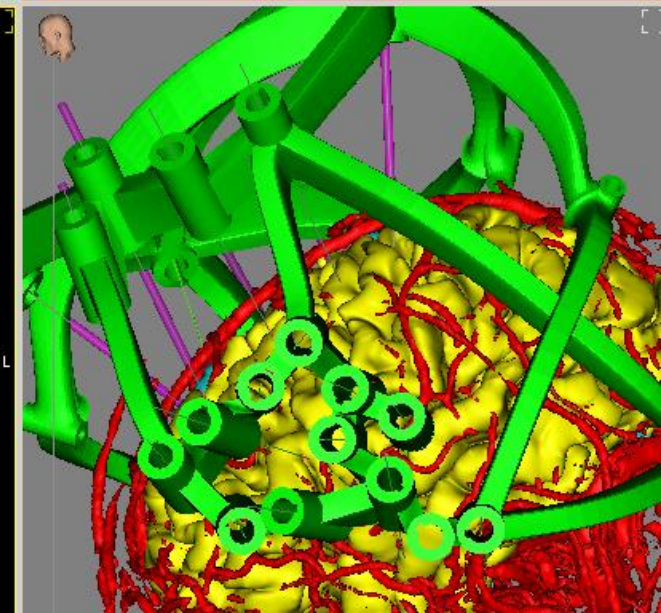
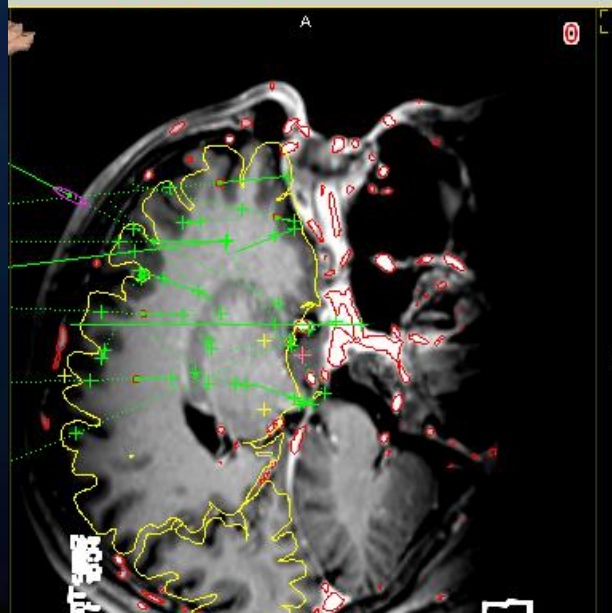
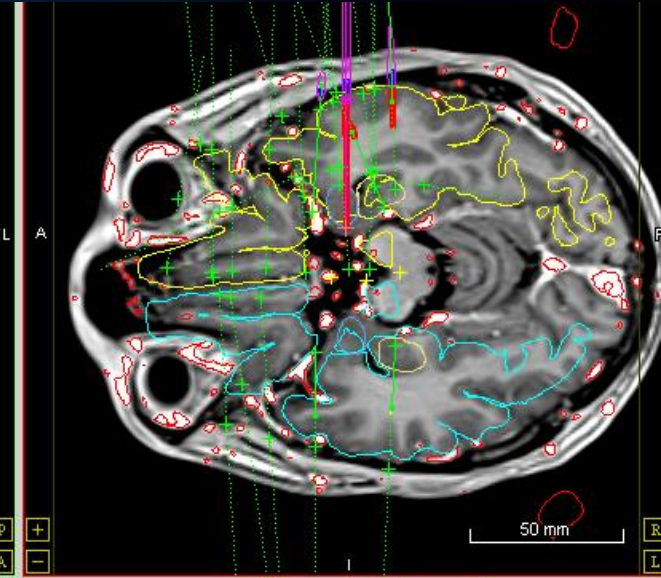
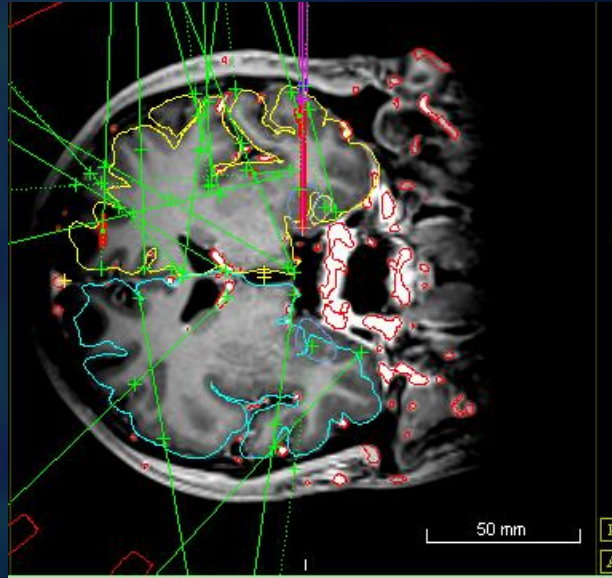
Presurgical step

- Anchor implantation – one week in advance
- CT scan - anchors act as fiducials



Trajectory Planning

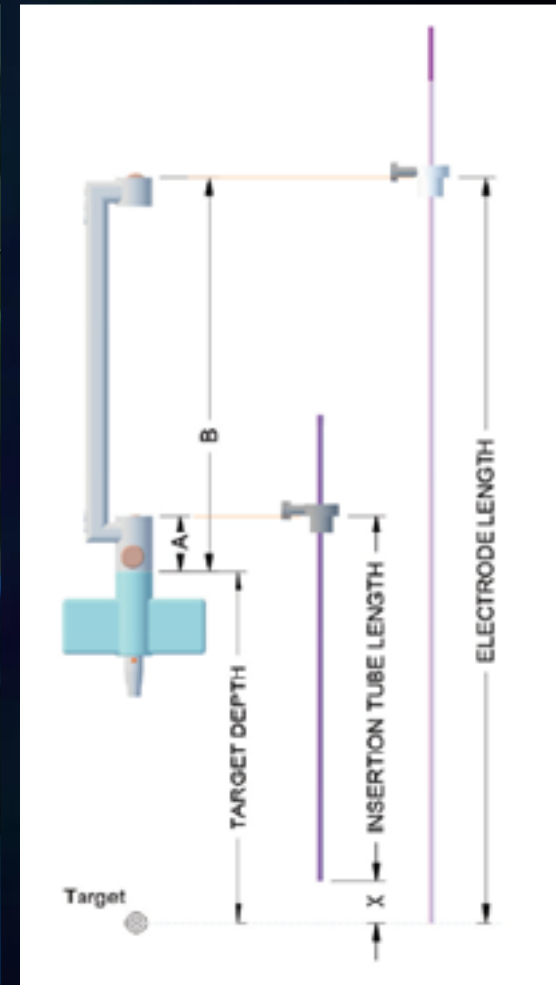
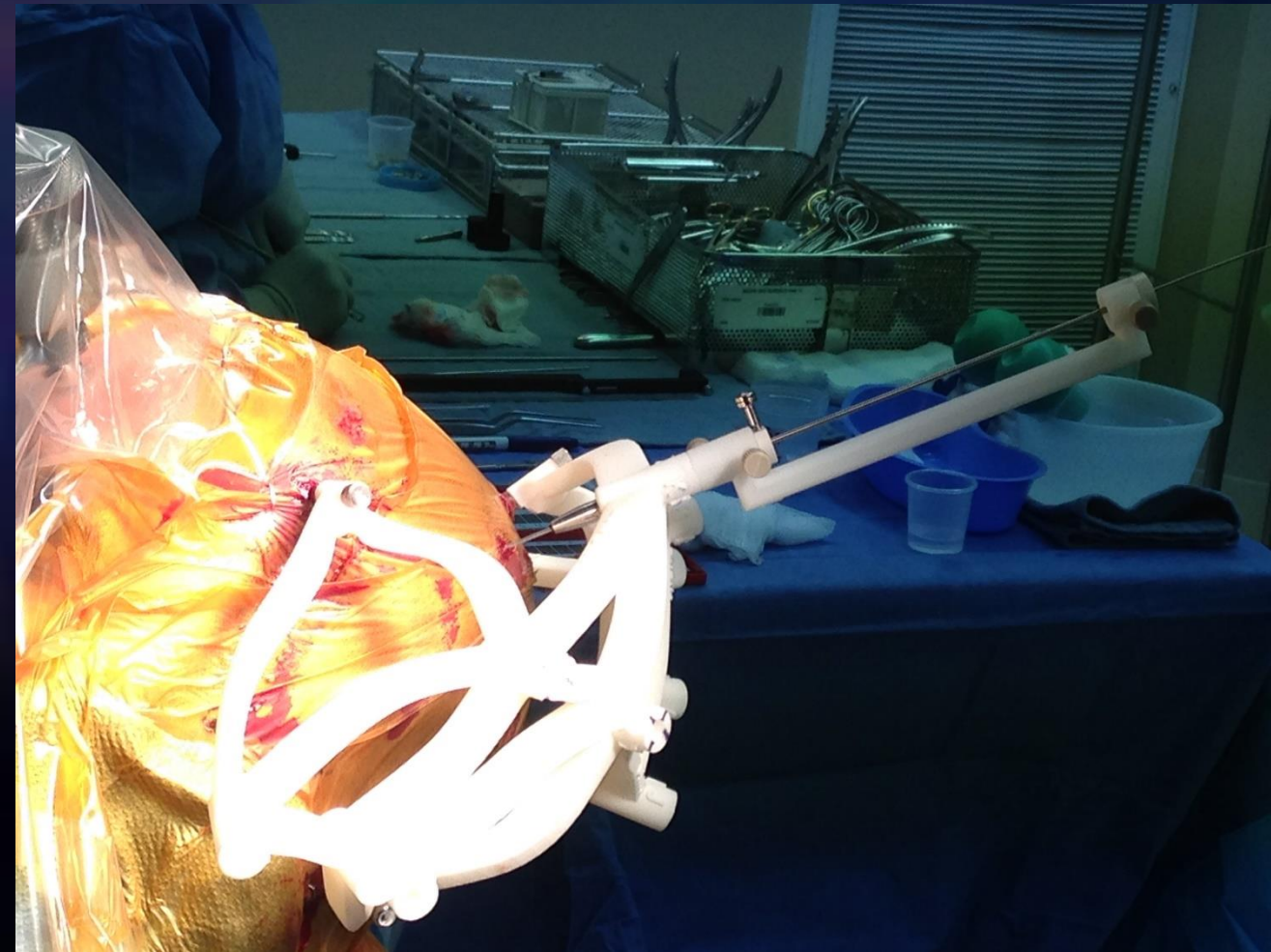
- Computer-generated 3D model of the fixture
- Physical device manufactured using 3D printing at manufacturer's facility



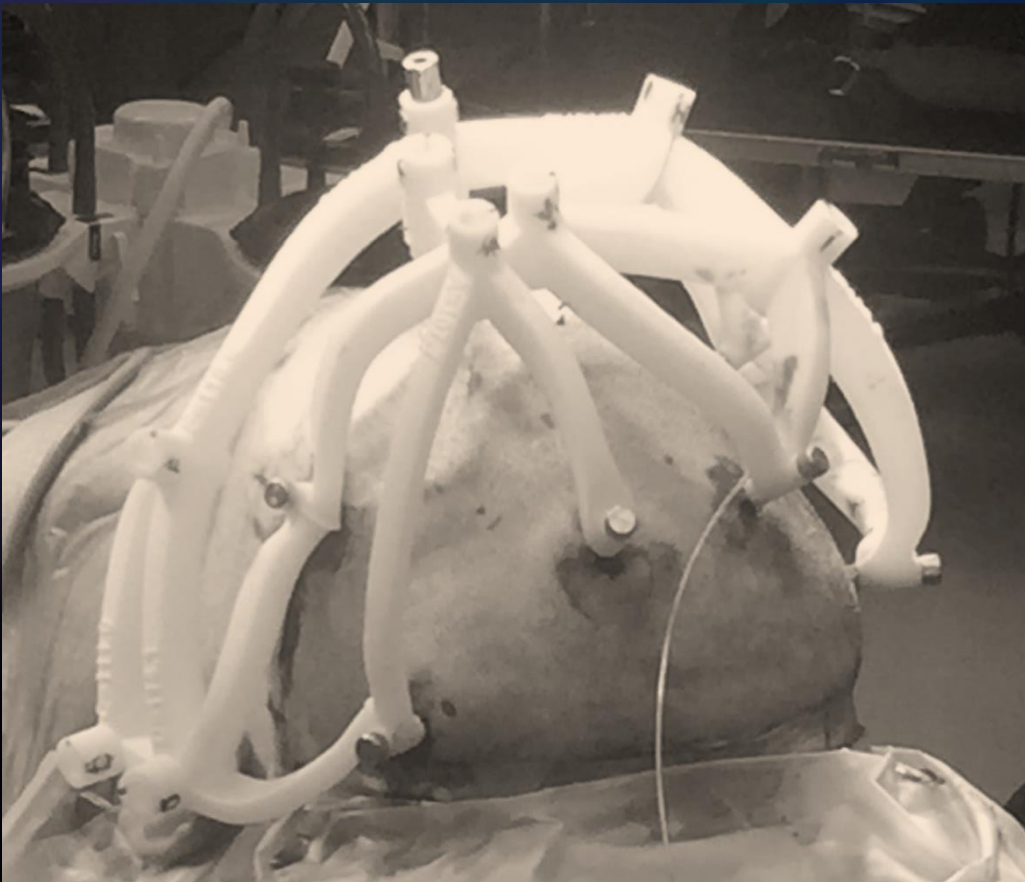
Surgical Theatre



Cannula-Based Insertion Method

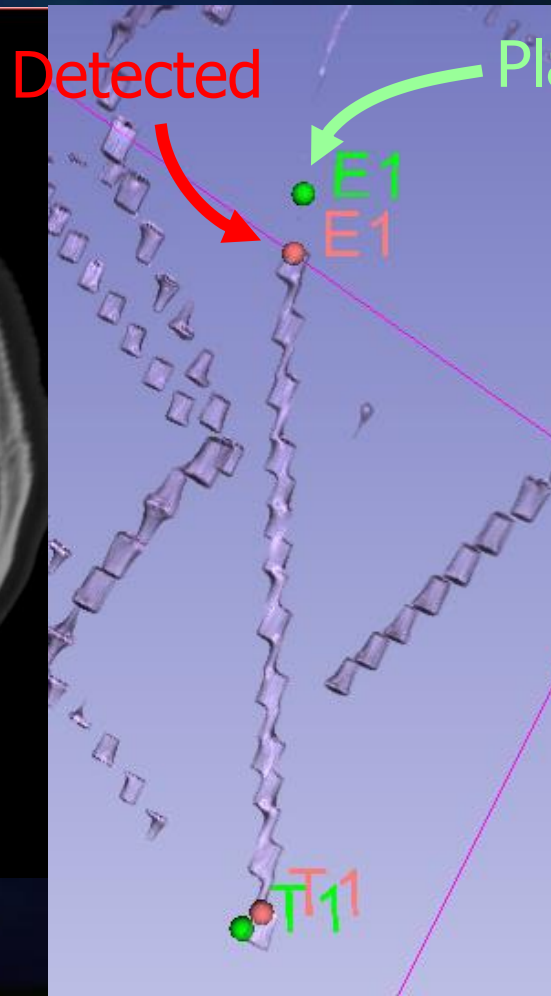


Anchor-based or Anchorless Implantation Method



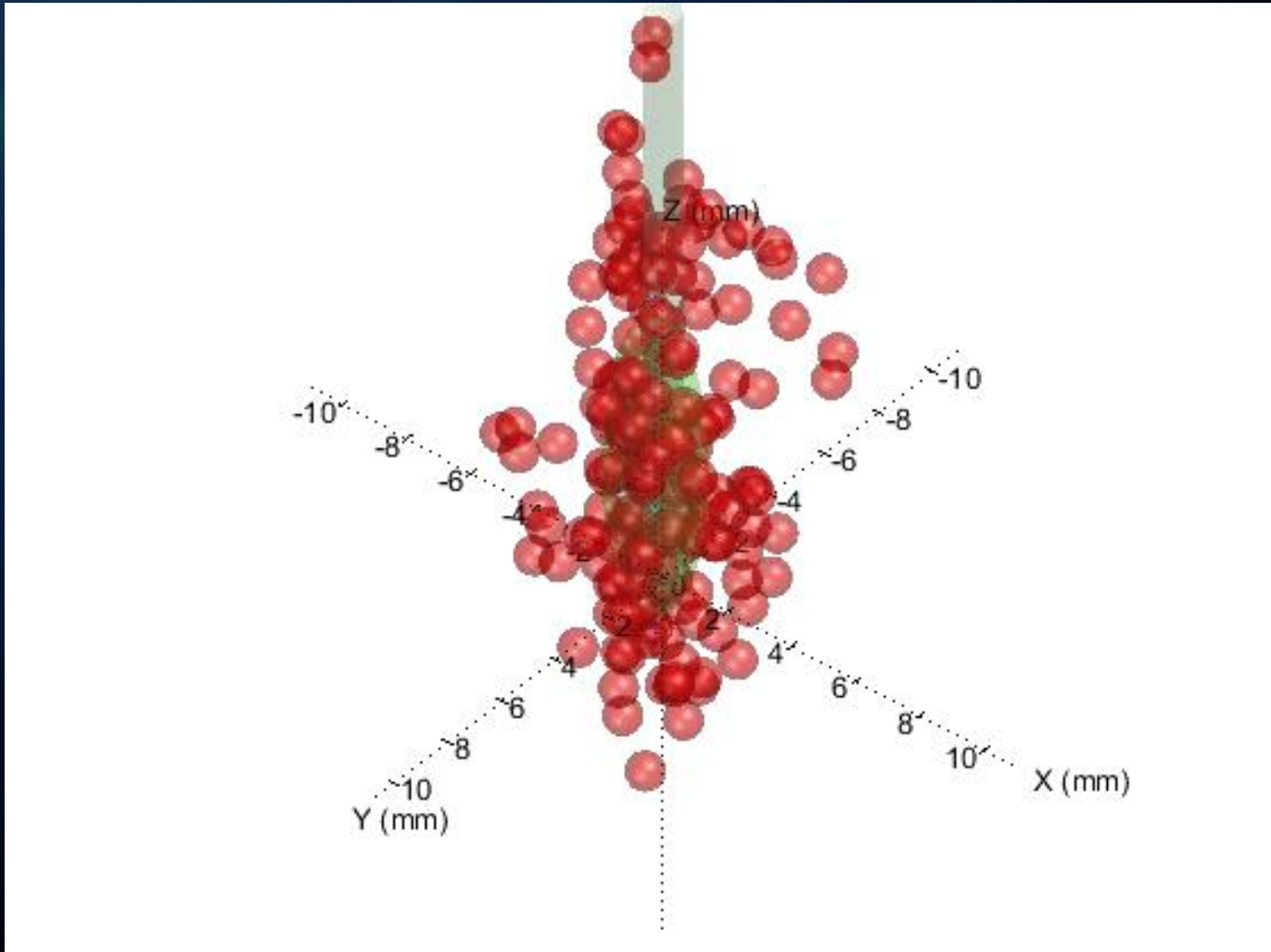
Implantation Accuracy

- **21** patients, **173** electrodes
- Automated lead detection using DEETO (Arnulfo et al., BMCI 2015)
- Lateral and total errors at entry and target



Implantation Accuracy

- All **173** electrode endpoints, relative to planned target location

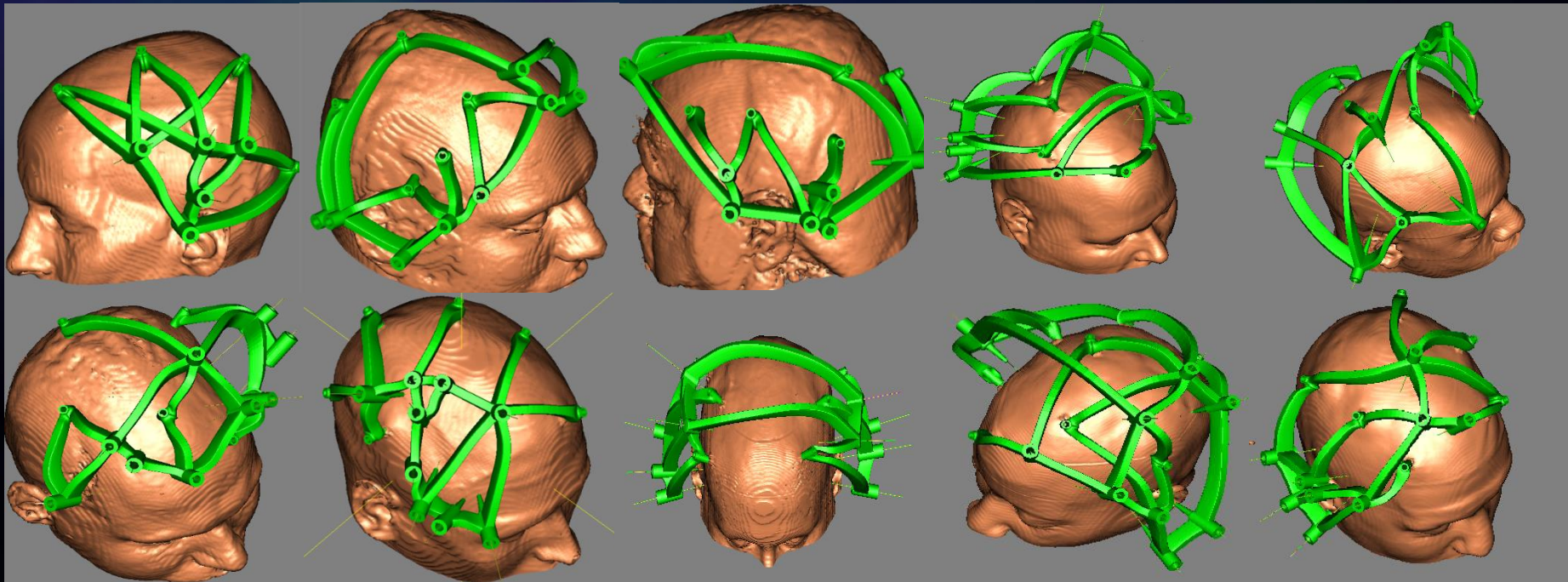


Implantation Accuracy and Safety

- **21** patients
- Localization errors (Median + interquartile range)
 - Lateral Entry Point: **1.17** [0.82-1.76] mm
 - Lateral Target Point: **1.22** [0.86-1.91] mm
 - Target Depth: **3.86** [0.55-7.13] mm – rounding, ruler reading, and anchorless attachment
- One incidence of small asymptomatic hemorrhage that did not result in any adverse clinical effects

Conclusions

- Personalized stereotactic fixtures are a safe and accurate alternative to using robotic arm for the implantation of depth electrodes in patients undergoing presurgical evaluation for drug-resistant epilepsy.



Thank You !

Additional Information

- Brain shift!

