INTRODUCTION
Transcranial ultrasound of multimodal electrodes into deep cerebral structures suspected of harboring epileptic foci and prolonged EEG recordings from multiple contacts along the electrodes, allowing sampling of superficial and deep structures.
Various methods are used for electrode implantation:
- Stereotaxic frame-based versus frameless
- Reference imaging: angiography, CT, CT angiography, MRI
- Manual versus robot-assisted
- Hardware: a variety of commercially available electrode and fixation peg types

A paucity of literature exists as to the accuracy of these methods. Most authors report 2 to 3 mm deviation from planned trajectory at the target point and a ~95% success rate.

METHODS
All patients undergoing depth electrode implantation between July 1st 2010 and September 31st 2011 were included. All planned trajectories were confirmed intra-operatively and targeted for planned trajectories and a ~95% success rate.

RESULTS
22 patients underwent SEEG investigation. 3 were excluded because of inadequate post-operative imaging. Manual group: 80 electrodes in 13 patients. Robot group: 37 electrodes in 12 patients. The mean pre-vs post-operative scan coregistration error was 1.0 ± 0.3 mm with no significant differences between the groups.

SUCCESS rate (ability to hit planned target) was 85% in the manual group and 100% in the robot-assisted group.

The mean pre- vs post-operative scan coregistration error was 1.0 ± 0.3 mm with no significant differences between the two groups (p > 0.1). Differences in depth error were not significantly different (4.1 vs 3.2 mm, p > 0.1).

CONCLUSIONS
The robot-assisted method was associated with significant improvement in electrode placement accuracy as assessed by target error, axial deviation and ability to hit the planned target.

Factors
- Improved intra-operative patient/image co-registration: although the assessment of intra-operative registration was indirect (using the external tip of fixation pegs as landmarks), additional solidity was probably provided by the fixation system of ROSA to the patient head fixation apparatus.
- Learning curve effect: Both surgeons were well experienced in the manual implantation method. The higher error rate can be mostly attributed to failure to correct planned electrode paths intra-operatively.
- Intrinsic robot characteristics: ability to position itself precisely and reliably into planned trajectory and ability to lock in the trajectory.

LIMITATIONS of the study:
- non-randomized
- Indirect assessment of intra-operative registration
- Inability to extract planned trajectories directly from ROSA software for comparison

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