

Introduction

SEEG (stereoecephalography) electrode placement methods include frame based, frameless, and robotic systems. We aim to evaluate the accuracy of electrode implantation using the FHC multi-oblique microTargeting platform without use of a rigid insertion cannula.

Methods

-182 depth electrodes were implanted in 13 patients who underwent SEEG using the multi-oblique microTargeting platform and Ad-Tech depth electrodes without a rigid guide cannula.

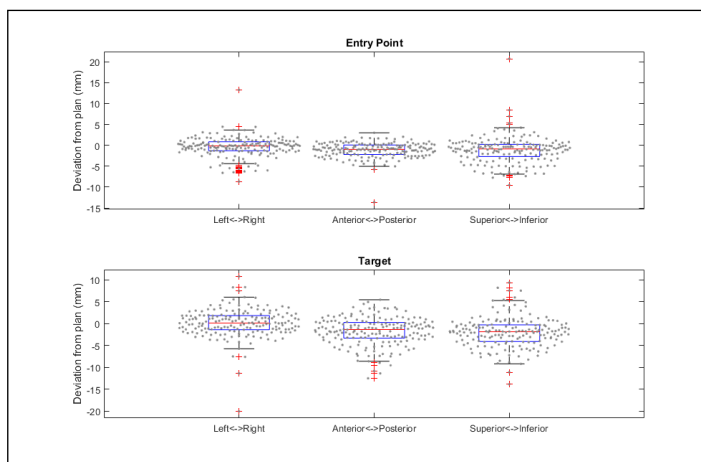
-MATLAB utilized to evaluate targeting accuracy. 3 manual coordinate measurements averaged with high inter-rater reliability.

-Measurements:

- Lateral entry point localization error (LEPLE)- perpendicular distance from entry point to planned trajectory
- Lateral target point localization error (LTPLE)- perpendicular distance from target point to planned trajectory
- Total target point localization error (TPLE)- Euclidean distance between actual and planned target point
- Target point depth- vertical side of right triangle composed of LTPLE (side) and TPLE (hypotenuse).
- Entry angle- between planned trajectory and skull
- Skull thickness

Table 2	N(%)	Mean (SD)	Range
Operative duration (min)	-	144 (24.23)	104-176
Number of electrodes	-	14 (2.80)	10-18
Single focus identified	11 (84.62)	-	-
Result of monitoring			
RNS	9 (69.23)	-	-
Temporal lobectomy	3 (23.08)	-	-
Other resection	1 (7.69)	-	-
Complications			
Non operative hemorrhage (per electrode)	3 (1.7)	-	-
Pulmonary embolism	1 (7.7)	-	-
Length of stay inpatient	-	14.77 (5.05)	9-26
Duration of follow up (months)	-	4.1 (2.93)	1.5-9.8
Engel class at follow up			
I	6 (50)	-	-
II	1 (8.3)	-	-
III	3 (25)	-	-
IV	2 (16.67)	-	-

Patient	Number of electrodes	Lateral EPLE		Lateral TPLE		Target Depth Error		TPLE	
		Median	IQR	Median	IQR	Median	IQR	Median	IQR
A	16	3.12	2.59-3.87	6.25	2.54-9.06	.87	.40-1.46	6.26	3.61-9.06
B	16	2.21	1.15-2.49	4.60	2.75-6.40	1.87	1.0-2.51	4.73	4.04-6.88
C	11	1.57	.93-1.73	3.16	1.72-6.75	1.52	1.05-2.34	3.36	2.87-7.03
D	16	2.40	1.82-2.65	4.30	3.03-5.48	1.82	1.20-2.49	4.70	3.33-9.23
E	10	2.97	2.14-3.92	3.85	2.06-6.09	1.70	1.35-2.81	5.17	3.24-6.35
F	16	1.18	.68-2.03	4.01	2.24-5.62	1.86	1.01-2.40	4.63	2.62-5.82
G	16	5.35	2.0-5.96	5.13	2.43-7.86	5.02	3.94-5.78	7.15	6.52-8.39
H	11	1.41	.77-2.48	3.49	1.84-5.54	.69	.47-1.20	3.64	2.03-7.10
I	12	1.35	.90-1.75	2.57	2.07-4.44	1.13	.80-1.57	2.75	2.28-4.72
J	9	2.08	1.24-2.85	5.09	2.15-8.14	1.65	1.18-1.71	5.39	2.22-8.37
K	14	1.61	.76-2.76	2.70	2.04-5.19	1.76	1.43-2.11	3.45	2.50-5.63
L	15	1.38	.87-1.98	4.73	1.46-6.86	1.78	1.52-2.05	5.11	2.53-7.48
M	18	2.10	1.24-2.53	3.88	2.26-5.70	2.12	1.60-2.42	4.29	3.38-6.20
TOTAL	180	1.98	1.20-2.85	3.95	2.18-6.23	1.71	1.03-2.33	4.95	2.98-6.85



Angle to skull	Number of electrodes	Mean LTPLE (SD)	Range
<50	6	6.30 (2.92)	3.49-11.89
50-60	32	6.69 (4.59)	1.25-25.10
60-70	57	4.84 (2.86)	.64-14.38
70-80	62	4.00 (2.44)	.75-10.77
>80	23	2.66 (1.74)	.32-6.95

Discussion

Angle of entry

Decreased angle of entry leads to significant increases in TPLE (coefficient -.068, SE .026, $p=.010$), LTPLE (coefficient -.084, SE .025, $p=.001$), and LEPLE (coefficient -.027, SE .011, $p=.017$).

Skull thickness

Increased skull thickness leads to increased LEPLE (coefficient .123, SE .036, $p=.001$).

Length of electrode

Increased length of electrode leads to increased LTPLE (coefficient .065, SE 017, $p=.047$).

Time since first operation

No correlation between the number of days since the first operation and any error measurement.

Conclusions

- Utilization of the FHC multi-oblique microTargeting platform without the use of insertion cannulae is safe, effective and accurate for placement of SEEG electrodes

-We recommend avoidance of acute trajectory angles for maximal targeting accuracy.

Learning Objectives

By the conclusion of this session, participants should be able to 1) Describe the utility of the FHC microTargeting platform without rigid insertion cannula and 2) Discuss factors predictive of improved electrode targeting accuracy

Table 1	N (%)	Mean (SD)	Range
Male	10 (76.92)	-	-
Age at surgery	-	35.62 (11.03)	21-57
Number of AEDs trialed	-	6.92 (2.40)	4-12
Epilepsy onset	-	13.38 (7.17)	3-26
Previous surgical interventions for epilepsy	6 (46.15)	-	-
Imaging findings pre-op			
Mesial temporal sclerosis	3 (23.08)	-	-
Structural abnormality	4 (30.77)	-	-
None or expected post-surgical findings	6 (46.2)	-	-
Reason for intracranial monitoring			
Bilateral ictal scalp EEG activity	3 (23.1)	-	-
Unclear laterality	3 (23.1)	-	-
Investigating anatomical abnormalities or competing foci	7 (53.8)	-	-