

Accuracy of Novel CT-guided Frameless Stereotactic Drilling and Catheter System in Human Cadavers

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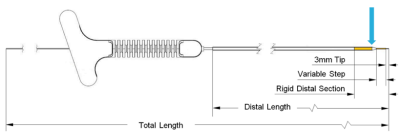
Introduction

Methods to achieve highly accurate placement of intracranial devices using frameless methods are needed. In the present study, we evaluate the accuracy of a CT-guided frameless stereotactic drilling and catheter system.

Methods

- Prospective, single-arm study
- Total of 20 catheter placements
- Primary endpoint: accuracy of catheter tip location as assessed by the deviation (mm) of the planned vs. actual tip position
- Secondary endpoints: target registration, entry and target point error
- Measurements are reported as mean +/- SD (median, range)

Figure 1. Schematic of Catheter



Schematic drawing of the flexible catheter.

Figure 2. Catheter and Drill Kit



Stabilizing drill kit (Left panel) and novel single-use, flexible catheter with bone anchor (Middle panel). Entire system with catheter inserted through the Varioguide (Right panel).

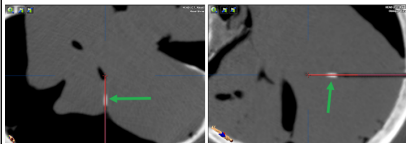
Conclusions

Highly accurate catheter placement is achievable using this novel system, placed via frameless stereotaxy, with an average target point deviation of 1.60 +/- 0.98 (1.40, 0.40-4.00) mm. Prospective studies, in live human tissue, are needed to confirm these findings.

Results

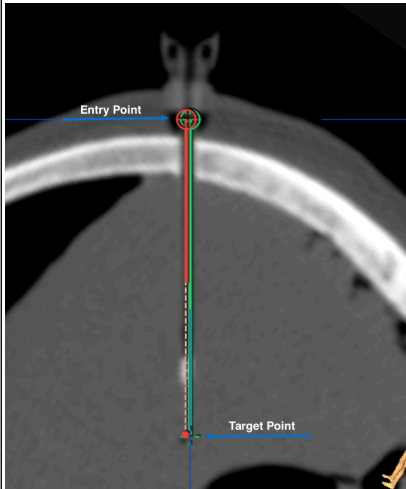
- Target registration error (TRE): 0.46 +/- 0.26 (0.50, -1.00-1.00) mm
- Two (10%) target point trajectories negatively impacted by drilling, with variances of 0.6 mm and 0.7 mm, respectively
- Deviation between the planned and the actual entry point on CT: 1.04 +/- 0.38 (1.00, 0.40-2.00) mm.
- Deviation between the planned and actual target point on CT: 1.60 +/- 0.98 (1.40, 0.40-4.00) mm.
- No correlation observed between the intracranial catheter depth and the target point deviation (accuracy) (Pearson’s coefficient: 0.018), technician experience and accuracy (Pearson’s coefficient: 0.020), or trajectories performed for different cadaver heads (p=0.362).

Figure 3. Exemplary Trajectories



Exemplary screen shots showing the visibility of the ceramic portion of the catheter on CT.

Figure 4. Entry and Target Points



Entry and target point deviation (i.e. accuracy).

Learning Objectives

To evaluate the placement accuracy of a novel, flexible intracranial catheter using frameless stereotaxy and a stabilizing bone-anchor and drill kit in human cadaver heads.

References

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