Investigation of Asleep versus Awake Motor Mapping in Resective Brain Surgery
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Introduction

Aims:
- To develop an asleep motor mapping paradigm for accurate detection of corticospinal tract (CST) during glioma surgery
- Compare outcomes with awake versus asleep patients undergoing surgery with this new paradigm

Hypothesis:
- We anticipate that no significant difference will exist between awake versus asleep patients undergoing resective brain surgery

Rationale:
- Brain tumors are often adjacent to brain eloquent areas (BEA) which complicates surgical resection
- Awake surgery is expensive, invasive to patients, and requires extensive personnel to perform

Introduction:
- The CST is a major white matter tract that is involved with motor function
- Patients with BEA tumors who are not candidates for awake surgery or are local to hospitals who can not perform awake surgery have few surgical options
- Motor mapping is a technique used during surgery to differentiate tumor from healthy brain tissue. Stimulating the motor homunculus can predict, which part of the body will move.

Methods:

Study Characteristics:
- N = 39 (16 asleep, 23 awake)
- Retrospective cohort study
- DSI and ITK-Snap for image processing
- Primary endpoints: EOR and neurological deficits at 3 months post op

Results: Novel Asleep Motor Mapping Paradigm

Figure 1. Motor Homunculus and Extraction of CST. Example of Motor Homunculus and MRI image sequences depicting a high-grade glioma with CST extraction.

Figure 2. Evoked AP Recordings in an Asleep Patient and Stealth Navigation illustrating Site of Stimulation. A-C) Example of eAPs recorded during surgery. D) Stealth navigation demonstrating site of stimulation.

Figure 3. Evoked AP Recordings Demonstrating Movement in an Awake Patient A-C) Example of eAPs in a patient that underwent awake surgery for resection of a glioma.

Discussion

Extent of Resection:
- EOR was greater in the asleep group (mean [SD] EOR 88.71% [17.56%]) versus the awake group (mean [SD] EOR 80.62% [24.44%]), although this difference was not statistically significant (P = 0.3802).

Neurological Deficits at Follow-up:
- 16 of 17 asleep patients and 23 of 26 awake patients were stable or improved in regard to motor function after surgery (P = 1.000).

Significance:
- A Novel asleep paradigm is significantly less invasive compared to awake surgery and is less expensive
- Hardware adapted for this study can be distributed to hospitals without capabilities to do awake surgery

Improvements:
- Increase sample size
- Apply technique to other tumor pathologies

Future Directions:
- Incorporate local community hospital centers in a multi-institutional study

References

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