Determinants of the pattern of emergence from anesthesia in patients undergoing anterior temporal lobectomy and amygdalohippocampectomy

ClinicalTrials.gov

NCT02360098

Date: 1 Dec 2014

Determinants of the pattern of emergence from anesthesia in patients undergoing anterior temporal lobectomy and amygdalohippocampectomy

Principal Investigator:

Dr Lashmi Venkatraghavan, MD, FRCA, FRCPC
Associate Professor, University of Toronto,
Department of Anesthesia, Toronto Western Hospital, University Health Network,
Phone: +1 (416) 603-5118
Email: lashmi.venkatraghavan@uhn.ca

Co-Investigators:

Dr. Suparna Bharadwaj, MD
Dr. Jigesh Mehta, MD
Dr. Pirjo Manninen, MD

Introduction

Smooth and quick emergence (wake up) from anesthesia is an important consideration in patients undergoing neurosurgical procedures as blood pressure changes associated with violent emergence can cause intracranial hemorrhage and brain swelling. Delirium and agitation can be dangerous and have serious consequences for the patient such as injury, increased pain, hemorrhage, selfextubation and removal of catheters requiring physical or chemical restraint. On the other hand, the unarousable patient may pose dangerous airway complications and limit neurological assessment in the immediate postoperative period.

Epilepsy surgery involves resecting epileptogenic tissues including limbic structures which may be functionally normal. Hence the emergence process can be complicated in patients having diseased limbic structures or those having therapeutic removal of limbic structures as in epilepsy surgery. Limbic structures are responsible for memory, language and executive function and hence loss of some of these higher functions is to be expected in the postoperative period. Preoperative neuropsychological assessments are often used to predict their risk for postoperative loss of higher functions and behavior changes. In our experience the investigators have seen that there is a spectrum of emergence characteristics in patients undergoing temporal lobectomy that can vary from dangerously agitated patient to much sedated, unarousable patient. Delirium and agitation can be dangerous and have serious consequences for the patient such as injury, increased pain, hemorrhage, self-extubation and removal of catheters requiring physical or chemical restraint. On the other hand, the unarousable patient may pose dangerous airway complications and limit neurological assessment in the immediate postoperative period. Hence it is essential to have a clue about post anesthesia emergence behavior in patients having epilepsy

surgeries. The aim of this study is to look at the pattern of emergence from anesthesia after epilepsy surgery and to determine if preoperative neuropsychological assessment help predict the pattern of emergence in patients undergoing anterior temporal lobectomy and amygdalohippocampectomy.

Background

Emergence from anesthesia starts with activation of deep brain structures namely subcortical and limbic regions of the brain. Later they become functionally coupled with other parts of brain including frontal and inferior parietal cortex. Arousal (spoken command) induced brain activations during emergence from anesthesia are mostly localized in deep, phylogenetically old brain structures (limbic cortex or mesial temporal structures) than in neocortex.[1]

Physiologically, when emerging from deep anesthesia there will first be signs of autonomic arousal, followed by a slow return of brainstem reflexes, eventually leading to reflexive or uncoordinated movements that occur somewhat before subjects can willfully respond to simple commands. Thus, emergence of a conscious state, precedes the full recovery of neocortical processing required for establishing contact with the surroundings. The prevalence of epilepsy is around 0.4–0.8%[2] and 20–30% of these patients will develop medically refractory seizures[2-4] and hence present for surgical treatment.

Epilepsy surgery involves resecting epileptogenic tissues including limbic structures which may be functionally normal. Anterior temporal lobectomy and amygdalohippocampectomy is a well-established surgical treatment for the patients with temporal lobe epilepsy and these parts of the brain have a role in the emergence from general anesthesia. Due to asymmetry of temporal neocortical (dominant vs nondominant) and mesial temporal functional representations, the loss of these structures and hence their functions in the postoperative period complicates emergence from anesthesia in these patients[3]. Preoperative neuropsychological assessments are often used to predict the risk for postoperative loss of higher functions and behavior changes.

Rationale

There are no study related interventions in this study and perioperative care of these patients will be as per our standard practice. The only study related protocol would be collecting the data on the emergence from anesthesia. The data will be collected from the time of turning off the anesthetic agents till the discharge from recovery room. Data collected include, vital signs, Glasgow coma scale (GCS), and Riker agitation- sedation score. The patients will be assessed every 5 minutes for the first 30 minutes and every 10 minutes for the next 60 minutes.

Study Objective and Hypothesis

The aim of this study was to look at the pattern of emergence from anesthesia after epilepsy surgery and to determine if preoperative neuropsychological assessment help predict the quality of emergence in patients undergoing anterior temporal lobectomy (ATL) and amygdalohippocampectomy (AH).

We hypothesized that there will be a relationship between preoperative neuropsychological assessment scores and the limbic structure (hippocampus, amygdala and thalamus) volumes with the quality of emergence from anesthesia in patients undergoing anterior temporal lobectomy and amygdalohippocampectomy.

Study Design

This prospective, observational study will be conducted after approval from institutional ethics board and written informed consent will be obtained from each subject.

Eligibility Criteria

Inclusion Criteria:
- Adult patients above the age of 18 who are scheduled for elective anterior temporal lobectomy and amygdalohippocampectomy under General Anesthesia

Exclusion Criteria:
- Lack of informed consent
- Patients needing intensive care unit postoperatively

Study Procedure

Standard perioperative management

Anesthesia and neurosurgical care of the patients is as per the standard institutional practice. Preoperatively all patients will be seen by the anesthesiologists in the pre-anesthesia consult clinic.

Intraoperatively, all patients will have standard monitoring consisting of electrocardiography (ECG), pulse oximetry, end–tidal carbon dioxide (ETCO2), invasive and non-invasive blood pressure, temperature, urine output, depth of anesthesia (Entropy) and end tidal anesthetic agent concentration.

Anesthesia induction will be with propofol (1-2 mg/kg), fentanyl (2-3mcg/kg) and rocuronium (0.8-1.2mg/kg).

Anesthesia will be maintained with oxygen, air, sevoflurane (0.8-1 MAC (Minimal Alveolar Concentration)) and remifentanyl infusion titrated to keep entropy within 45-55.

After induction and positioning, the surgery (ATL and/or AH) will be proceeded as per standard. After dural closure, inhalational agent concentration will be decreased gradually to MAC of 0.6 and fentanyl 1-2mcg/kg administered for additional analgesia.

After the closure of scalp, inhalational agent will be turned off.

Remifentanyl infusion will be turned off once the head is disengaged from head pins and after completion of the head dressing.

The patients will be allowed to wake up with “no touch technique”.

Extubation will be done when the patients are breathing adequately, spontaneously and obeying commands.

Post-surgery, patients recovered in the post anesthesia care unit (PACU) before being discharged to the neurosurgical critical care unit.

Data Collection

Data will be collected from the time of turning off the anesthetic agents till the discharge from recovery room. Patients will be assessed every 5 minutes for the first 30 minutes and every 10 minutes for the next 60 minutes. Data collected will include patient demographics, preoperative neuropsychological assessment data, Age, Intelligence quotient (IQ), Verbal, visual, language memory , education, History of psychiatric illness, Dexterity of the patient and side of surgery, Time of emergence from anesthesia, Vital signs, Glasgow Coma Scale (GCS) score, and Riker agitation score (7-agitated;dangerous agitation, 6-very agitated, 5-agitated, 4-nonagitated;calm and cooperative, 3-sedated but arousable, 2-very sedated, 1-unarousable).

Data Analysis

There are no previous studies looking at the emergence characteristics in patients with temporal lobectomy. As this is an observational study, there are no cause effect relationship to calculate sample size. Emergence characteristics were classified as either smooth emergence (Riker scale 3-4) or agitated emergence (Riker scale >4). Correlation coefficients will be used to compare the data between preoperative neuropsychological scores and the emergence characteristics (smooth vs. agitated) and the time of emergence. Quantitative variables like hemodynamics will be analyzed using student`s t-test. Qualitative variables like sex distribution will be analyzed using Chi-square test. A p-value less than 0.05 is considered significant.

CONCLUSION

Smooth emergence (wake up) from anesthesia is an important consideration in patients undergoing neurosurgical procedures as blood pressure changes associated with violent emergence can cause intracranial hemorrhage and brain swelling. At the same time, emergence should also be quick so that patients' neurological function can be assessed at a timely manner. Pattern of emergence from anesthesia is poorly investigated and understood.

REFERENCES

1. Jaakko W. Långsjo, Michael T. Alkire, et al. Returning from Oblivion: Imaging the Neural Core of Consciousness. The Journal of Neuroscience. 2012; 32:4935– 4943

2. Hauser WA, Rich SS, Annegers JF, et al. Seizure recurrence after a 1st unprovoked seizure: an extended follow-up. Neurology 1990;40: 1163–70.

3. Gilliam F. The impact of epilepsy on subjective health status. Curr Neurol Neurosci Rep 2003; 3:357–62

4. Friedman EB, Sun Y, Moore JT, et al. A conserved behavioral state barrier impedes transitions between anesthetic-induced unconsciousness and wakefulness: evidence for neural inertia. PLoS One. 2010; 5: e11903.