Anesthetic Management of a Pediatric Awake Craniotomy with Intraoperative Magnetic Resonance Imaging: a Case Report

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Introduction

Awake craniotomy using electrophysiologic mapping (EPM) has been shown to improve the safety margin of resection of lesions affecting the eloquent cortex. The advent of intraoperative magnetic resonance imaging (iMRI) offers the opportunity for aggressive resection of tumors and when combined with awake craniotomy, centers the prospect of more complete tumor removal (1). However, there are substantial risks associated with iMRI especially when operating in the presence of a high strength magnetic field. A combination of personnel education, use of MRI compatible equipment, and appropriate patient selection are paramount to successful utilization of this technology. This combined surgical approach has been described for adults using both pure sedation and asleep-awake-asleep anesthetic techniques (2). In the pediatric population, sedation and asleep-awake-asleep techniques for awake craniotomy have been published (3); however, an anesthetic approach to awake craniotomy with iMRI has not been reported. We describe a case report that combines both these techniques in a pediatric patient using pure sedation.

MRI Background

In order to deliver safe patient care in iMRI, it is necessary to understand the concept of safety zones that are common to all MRI environments. The American College of Radiology (ACR) has divided the MRI area into four zones to create a common nomenclature and safety zones that are common to all MRI environments. The American College of Radiology (ACR) has divided the MRI area into four zones to create a common nomenclature and

The Case

- A 16 year-old, ASA 3 female with history of intractable seizures secondary to a frontal lobe lesion presented for craniotomy.
- The preoperative IMRI and SPECT scan showed the lesion to be affecting the motor homunculus for face and tongue thus necessitating an awake craniotomy. This was scheduled in the IMRI suite with 1.5T movable IMRI device after thorough preoperative psychological assessment to ascertain patient suitability.

Preoperative Course

- The patient’s past medical history was otherwise unremarkable and she had no past surgical history. She took Oxcarbazepine daily for seizure prophylaxis and had no known drug allergies.
- The preoperative physical examination, vital signs, and airway examination were normal. The patient’s past medical history was otherwise unremarkable and she had no known drug allergies.
- The patient remained under deep sedation for the craniotomy and duratomy.
- A scalp block was performed by the surgeons whilst under deep sedation prior to mapping the patient’s head in pins.
- Additional intravenous cannulation, arterial cannulation, and Foley placement were continued on deep sedation to allow for further resection. Upon completion of the 11 hour surgery, the sedation was discontinued, the patient was awakened, and taken to post-anesthesia care unit (PACU) for recovery.

Postoperative Course

- The PACU course was uneventful, with adequate pain control and no nausea. The patient was admitted to the intensive care unit overnight, then transferred to the general care floor on postoperative day #1.
- The patient was discharged from the hospital on postoperative day #3 with no anesthetic or neurologic complications.
- Six-month follow-up revealed no further seizure episodes and imaging showed no evidence of tumor recurrence.

Intraoperative Course

- Standard ASA, MRI-compatible monitors were applied as well as supplemental oxygen via nasal cannula and end-tidal CO2 monitoring capability.
- Sedation was initiated with infusions of a combination of propofol and remifentanil. Spontaneous breathing was maintained with supplemental oxygen via nasal cannula and nasal trumpet was placed to relieve mild airway obstruction that developed with deep sedation.
- A scalp block was performed by the surgeons whilst under deep sedation prior to placing the patient’s head in pins.
- The patient remained under deep sedation for the craniotomy and duratomy.
- The level of sedation was then lightened for the awake EPM. The patient tolerated the EPM well on low-dose propofol and remifentanil infusions with no impairment of communication.
- Once the mapping was completed, the sedation was again deepened for tumor resection.
- After tumor resection, in preparation for the IMRI, the scalp was loosely approximated and the head was covered in special clear drapes to maintain sterility and allow adequate airway access (Figure 2). Prior to the deployment of the magnet all communication.
- Imaging revealed residual tumor, thus the scalp block was supplemented and the patient was continued on deep sedation to allow for further resection. Upon completion of the 11 hour surgery, the sedation was discontinued, the patient was awakened, and taken to post-anesthesia care unit (PACU) for recovery.

Discussion

Both the pediatric awake craniotomy and intraoperative MRI are specialized procedures with many potential pitfalls of their own. Combination of these techniques can compound the hazards; however, when performed with experienced personnel in the appropriate patient, the pediatric awake craniotomy with MRI can grant the ideal setting for maximal tumor resection in the eloquent cortex... This report illustrates a pure sedation technique in a pediatric patient for an awake craniotomy in an intraoperative MRI suite. It demonstrates a novel approach that eliminates the vulnerabilities of inducing and emerging from general anesthesia while in a Mayfield frame for a surgical approach for which there is no literature to guide anesthetic selection in the pediatric population.

References