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Awake Craniotomy: Lessons Learned

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Abstract: Awake craniotomy is still in its evolutionary stage and is generally successful in a highly motivated patient. The attending anesthesiologist must ensure that patient is optimally sedated and pain free yet readily arousable. In addition, it is essential to have a Plan B and C ready in case the first one fails. We adopted awake craniotomy technique in a 33 yr old male patient undergoing excision of frontal glioneuronal tumor that produced recurrent convulsions. Despite blockade of six nerves in the scalp bilaterally and sedation with combination of dexmedetomidine-fentanyl, patient felt sharp pain when scalp pins were placed. Despite assurance that he would not feel pain any further, patient refused to proceed any further. However, activating Plan B using supraglottic device and sedation with propofol resulted in successful completion of the surgery in which patient was briefly woken up to perform neurocognitive testing before putting back to sleep till the end of surgery. Lessons learned from this case report were that inadequate motivation and a hasty placement of scalp pins should be avoided to make awake craniotomy successful.
Keywords: Awake craniotomy, Dexmedetomidine, Propofol, Fentanyl, Remifentanil, Proseal laryngeal mask.

INTRODUCTION

Awake craniotomy is a challenging task for the anesthesiologist and the operating surgeon. The surgeon has to be gentle and precise. Anesthesiologist must ensure that patient is optimally sedated and pain free yet readily arousable during intraoperative neurocognitive testing by the surgeon. Two most commonly employed techniques during awake craniotomy are Asleep–Awake–Asleep (AAA) technique and the Monitored Anaesthesia Care (MAC) technique. The following case report outlines the awake craniotomy technique adopted in this patient and important lessons learned during patient management.

CASE REPORT

A 33-year old ASA II male patient weighing 98 kg with history of recurrent convulsions secondary to glioneuronal tumor in the right frontal lobe region was admitted for awake craniotomy and excision of lesion. The patient was on sodium valproate. He had no other systemic illnesses. All relevant investigations were within acceptable limits.

A detailed discussion was held with the patient in the preanaesthetic clinic and again re-enforced in the ward a day prior to surgery about each step of awake craniotomy and the need for him to be cooperative. Possibility of asleep-awake-asleep sequence was also discussed and consent obtained.

On the day of surgery, patient was premedicated with glycopyrrolate, ondansetron, and dexamethasone 4 mg each intravenously approximately 15-20 min prior to moving the patient to the operation theatre.

In the operation theatre, patient was administered two IV bolus doses of fentanyl 50 + 50µg 5 min apart. Thereafter, dexmedetomidine infusion was started as 0.5 µg/kg slow bolus over 20 min and then at a slower infusion rate of 0.5-1.0µg/kg/hr to keep the patient mildly sedated and hemodynamically stable but without respiratory depression. The attending anesthesiologist now proceeded to block six nerves bilaterally using 20 ml of 0.5% bupivacaine as described by Pinosky *et al*. [1]. These nerves included: a) supraorbital, b) auriculotemporal, c) zygomaticotemporal, d) lesser occipital, e) greater occipital and f) greater auricular nerve. In addition, line of incision was infiltrated with 15 ml of 0.25% bupivacaine. Five min later, the patient was placed in Mayfield scalp fixator using 3 pins. As the pins were being tightened, the patient felt pain and became very apprehensive. 50 µg of remifentanil was quickly administered. Despite assurance that this pain is transient and would not recur, patient desired to be put to sleep. It was now decided to use AAA technique using Proseal Laryngeal Mask (PLM) to secure the patient's airway. Dexmedetomidine infusion was stopped because of its long terminal half-life. Since the

patient was already drowsy from dexmedetomidine, 70 mg propofol was now administered and PLM easily placed after spraying the oropharyngeal space with 10% lidocaine. Cuff inflation with just 10 ml air was sufficient to give an adequate seal. Low dose remifentanil (2μg/kg/hr) and propofol (1 mg/kg/hr) infusions were started. Patient's breathing became shallow and he was put on assisted mode of ventilation. Monitoring included continuous ECG, invasive recording of arterial blood pressure, pulse oximetry and end tidal carbon dioxide. EEG was monitored by the neurophysicist. On opening the dura, brain was found to be relaxed and pulsating. Surgery proceeded uneventfully for about 80 minutes till the surgeon decided to have the patient awakened for neurocognitive assessment. At this stage propofol infusion was stopped and remifentanil infusion reduced to half. Approximately 7 min later the patient woke up and tried to move his head and arms. PLM cuff was deflated and the device removed. The patient was breathing adequately but was not very clear headed as per anesthesiologist's expectation. However, the operating surgeon was satisfied with the response he obtained to his command. The patient was once again put back on infusion of remifentanil and propofol. PLM was re-inserted with the aid of introducer tool. The entire surgery lasted for about two hr and forty min. Blood pressure, oxygen saturation and end tidal CO_2 ranged between 104/66-136/78, 96-99% and 33-38 mmHg respectively during the intraoperative period. Alpha waves on EEG were continuously present throughout the period of surgery with occasional mild suppression denoting near awake state of the patient despite the low dose infusion of remifentanil and propofol.

Patient made an uneventful recovery and was discharged on the 7th postoperative day.

DISCUSSION

There are two important pre-requisites for successful awake craniotomy. First, high level of patient motivation and second, an optimal level of sedation in combination with good analgesia using nerve blocks and intravenous analgesics such that patient does not feel the pain of surgery but is easily arousable. Our patient was well prepared for achieving these two aims. Unfortunately, our patient felt acute pain as the Mayfield scalp fixator pins were tightened. This may have been averted if we had waited for 10-15 min after nerve block or infiltrated the point of pin fixation with additional local anesthetic or administered a bolus of remifentanil. This was the first crucial lesson learnt during this case management.

The second important lesson learned was that a more detailed patient counseling should be done while performing preanaesthetic checkup. One should always discuss with the patient the possibility of an occasional pain that would be taken care of by the attending anesthesiologist. Had this been done, we may not have had to change our initial plan of MAC to AAA. Inadequate communication remains the main cause of failed awake craniotomy [2].

Since our patient felt acute pain during pin fixation, he requested to be put to AAA technique (Plan B) for the surgical procedure. Under the effect of dexmedetomidine and fentanyl, patient was not receptive to our suggestion of continuing with the planned approach of MAC though his pain disappeared with a 50μg bolus of remifentanil. We had no option but to comply with his request. AAA is a well-accepted technique at some centers while undertaking this type of neurosurgical procedure [3]. However, during AAA technique patient's airway needs to be secured such as by using laryngeal mask airway [3]. In our patient we used the PLM for securing his airway.

Propofol is widely used for awake craniotomy because of its easily titratable sedative effect and rapid recovery with clear-headedness [4-6]. Propofol also offers the advantage of reduced incidence of seizures and nausea/vomiting. However, over sedation and respiratory depression can occur during propofol infusion and should be closely monitored [7]. Our revised technique of using a combination of propofol and remifentanil has also been used by several other workers with satisfactory outcome [3, 8]. Combination of propofol and remifentanil needs close supervision, as the incidence of respiratory depression is quite high [9].

Dexmedetomidine, a highly selective α2 adrenoceptor agonist is also a popular choice for awake craniotomy due to its good analgesic and sedative properties without causing significant respiratory depression [4, 10-12]. In addition, dexmedetomidine has no significant effect on intracranial tension [13]. Although we started with dexmedetomidine bolus followed by its infusion but decided to abandon it in favor of propofol once the patient requested for AAA technique. This was keeping in mind that propofol provides better toleration of oropharyngeal airway device and patient makes a fast clear-headed recovery on its discontinuation.

CONCLUSION

In conclusion, awake craniotomy technique is still evolving with multiple techniques reported in literature. One should choose a technique that is best suited to his/her institution with a sound backup plan in case the primary technique fails. The suggested areas for improvement include provision of written information in the form of brochures and undertaking a more detailed discussion with the patient.

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