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CLINICAL INFORMATION

Anesthesia for awake craniotomy: case report

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Abstract
Background and objectives: Some intracranial procedures are achievable with patients awake, however, there are challenges ranging from patient compliance to homeostasis. The aim of this study is to present a case of intracranial surgery for removal of a tumor in the left parietal lobe with the patient awake during the procedure.
Case report: After patient selection and psychological preparation, the proposed excision of the left parietal lobe lesion in the waking state was clarified and accepted. Continuous infusion of propofol and remifentanil was administered to maintain a Ramsay score of 2-3. The bilateral scalp blockade was performed with ropivacaine. The Mayfield head fixation device was installed and drapes adjusted to maintain the airway and eyes accessible for mapping with electrical stimulation and tumor excision. For dura mater incision, a pad with 2% lidocaine was applied for 3 minutes. The surgery was uneventful. The patient was discharged on the seventh day of hospitalization without presenting complication.
Conclusion: Although the maintenance of analgesia and hemodynamic stability was a challenge with the patient awake, the target-controlled infusion of propofol provided the desired level of consciousness, remifentanil titrated analgesia and sedation without drug accumulation, and the blockade with ropivacaine provided satisfactory analgesia. We conclude that the anesthetic technique was satisfactory for our patient.

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Introduction

Because lesions are located in functional areas of the brain, some intracranial surgical procedures are suggested in awake patients.[1,2] The challenges for anesthesiologists are performing sedation-analgesia and assuring cardiorespiratory stability without interfering with electrophysiologic monitoring and cognitive tests.[1,2]

Some criteria should be used, such as drugs with rapid onset of action, easy titration, with minimal effects on the cardiovascular and respiratory systems, which do not cause nausea or vomiting or interfere with the neurological assessment and EEG.[3,4] Moreover, careful selection of patients, high levels of motivation (both patient and staff), and psychological and emotional meticulous preparation are key elements for a successful procedure.[1,4,5]

The use of ropivacaine for scalp block results in lower pain scores and less need for analgesics in the first 48 hours after supratentorial craniotomy.[6,7] Its combination with remifentanil and propofol for sedation is an attractive option because it promotes a synergistic analgesia, ensures acceptable sedation, and decreases the incidence of nausea and vomiting.[6-9]

The aim of this case report was to present the sedation technique with propofol and remifentanil combined with ropivacaine for scalp block in neurosurgery for tumor resection. This technique allowed the main surgical steps without the occurrence of major complications, such as psychomotor agitation, respiratory depression, hemodynamic changes, and excessive sleepiness, without airway manipulation and, mainly, it did not affect the patient's cognitive evaluation.[6-9]

Case report

Male patient, 36 years old, 95 kg, 1.95 cm, who presented to the outpatient neurosurgical department with a history of seizures since 9 years old. Two months before the surgery, he had approximately five seizures per week associated with decreased strength in his right leg, predominantly on the right foot, but with preserved sensation. A month earlier, the patient started having vertigo, with loss of balance and requiring support to walk.

Computed tomography and magnetic resonance imaging of the brain were made and showed two hyperdense lesions in the left hemisphere: a small frontal lobe mass and a larger one in the left parietal. Radiological findings were compatible with cavernomas. After the paramagnetic agent infusion, the lesion located on the left parietal transition showed a serpiginous enhancement, suggestive of vascular origin with diameters of 7-16 mm (Fig. 1).

In the pre-anesthetic evaluation, neurological examination showed difficulty in flexion and extension of the right foot without any other changes, blood pressure of 120 × 80 mm Hg, and heart rate regular at 98 bpm. The patient was regularly taking valproic acid (1 g every 12 hours), carbamazepine (400 mg every 8 hours), and clobazam (10 mg every 12 hours). Additional tests were normal.

The patient and his family were informed about the surgical and anesthetic procedures and possible complications. After accepting the anesthetic protocol, the informed consent form was signed.

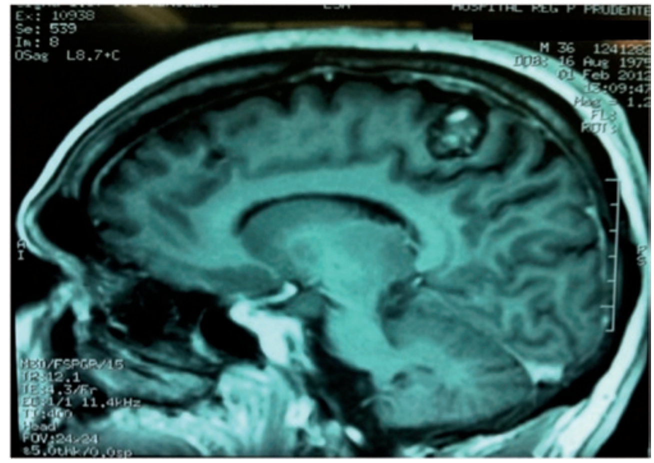

Figure 1 Radiological image showing a hyperdense lesion in the left parietal transition.

On the morning of the procedure, the standard anticonvulsant medication was administered. In the operating theatre, the patient was calm, oriented, Glasgow 15. In the operating room, the patient was positioned in a manner designed to avoid injury to peripheral nerves and endure several hours in the same position.

Monitoring consisted of ECG with continuous ST segment analysis, pulse oximetry, invasive blood pressure (left radial artery), nasopharyngeal temperature, arterial blood gases when prompted, blood glucose, and urine output. Venous puncture (20G and 18G) was performed. Prophylactic antibiotic therapy was administered with (cefuroxime 1.5 g), dimenhydrinate (30 mg), ondansetron (8 mg), and dexamethasone (10 mg). During this procedure, mannitol (50 g), hyperosmolar solution of 7.2% NaCl (210 mL), and furosemide (20 mg) were administered.

Target-controlled infusion (brain) was started with propofol 1%, according to Schnider's model, between 0.6 and 1 $\mu g \cdot mL^{-1}$; and after 5 minutes, remifentanil was initiated according to Minto's model, between 0.2 and 0.4 $ng \cdot mL^{-1}$. After 15 minutes from the start of remifentanil, the bilateral scalp block with ropivacaine 0.2% (total dose: 30 mL). After scalp blockade, the doses of propofol and remifentanil were reduced by 50% and adjusted to maintain Ramsay score of 2-3.

The Mayfield head fixation device was installed and drapes adjusted to maintain the airway and eyes accessible for mapping with electrical stimulation and tumor excision.

For dura mater incision, a pad with 2% lidocaine was applied for 3 minutes. Our experience has shown that patients who have not benefited from an anesthesia of the dura mater complained of pain during the incision.

The mapping was done with electrical stimulation of 2 to 6 μs, and possible motor or verbal changes were observed.

Throughout the surgical procedure the patient had no pain episode. At the end of surgery, dipyrone (2 g), ketoprofen (100 mg), ranitidine (150 mg), and ketamine (10 mg) were administered as prophylaxis.

The patient remained in the PACU for 2 hours 30 minutes, in order to detect any clinical changes requiring prompt surgical reintervention, which was not necessary in this case. The procedure chronology is summarized in Fig. 2.

The patient was then taken to the intensive care unit (ICU) and discharged uneventfully after 8 hours. There was no laboratory change, and the patient was discharged on the seventh day of hospital stay, without complications and with remission of seizures.

Discussion

Although awake craniotomy is well established for epilepsy surgery, only recently it has become more popular for tumor surgery.[5,10,11]

Complications of awake craniotomy include seizures, cerebral edema, nausea and vomiting, decreased level of consciousness, neurological deficit, pain, and loss of patient cooperation. Therefore, this procedure requires continuous monitoring, use of agents with short half-life, and the combination or not of a regional block[1,4,5] (scalp block and dura mater topical anesthesia).

Seizures may occur unexpectedly, especially during brain mapping (5-20% of cases), due to decreased levels of anticonvulsants or local anesthetic toxicity.[5,10-12] Such attacks may be focal or generalized, but generally self-limited and, during the postictal phase, tracheal intubation may be needed.[11,12]

A major concern during the intraoperative period is to maintain a patent airway and an oriented and cooperative patient.[12] The non-use of tracheal intubation allows us to eliminate the possibility of coughing or airway irritation when handling such devices (endotracheal tube, laryngeal mask airway, Guedel or nasopharyngeal tubes). Cough may lead to an increased intracranial pressure and cerebral bulging. Similarly, the reinsertion of an intubation device during a surgical procedure may be difficult, especially when endotracheal intubation is selected.

The patient may refuse to cooperate for different reasons, including poor preoperative preparation, inadequate sedation, insufficient analgesia, uncomfortable position or prolonged surgical time that, for procedure safety, requires the conversion to general anesthesia.[1,4]

The incidence of nausea and vomiting is variable, depending on the patient's history, type of injury, drug administration, and type of anesthesia. Surgical manipulation of the temporal lobe, amygdaloid region or meningeal vessels, and inadequate analgesia and hypovolemia may contribute to increase the incidence.[10,12] However, it may be minimized by judicious choice of anesthetics with antiemetic properties combined with steroids and specific antiemetic drugs.[11,12]

Halogenated anesthetics and nitrous oxide should be avoided during surgery with the patient awake, as these substances cause a dose-dependent distortion of the electroencephalogram (EEG). High doses of propofol, etomidate, and opioids may also disturb the EEG and respiration.[5,7,12]

In our patient, the scalp block with ropivacaine provided effective anesthesia and the sedation with propofol and remifentanil a satisfactory comfort and relaxation. The combination of these two techniques allowed the excision of the tumor boundaries, without damage or deficits for the patient who had early mobilization and was discharged uneventfully.

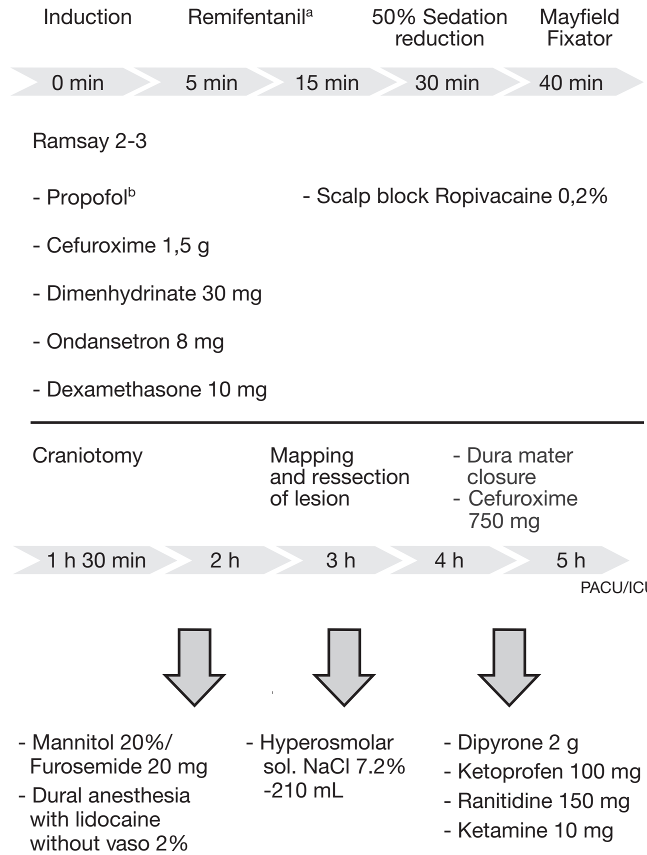

Figure 2 Summary of the surgical procedure progress. ICU, intensive care unit; PACU, post-anesthesia care unit.
[a] **Remifentanil according to Minto's model (0.2-0.4 ng/mL).**
[b] **Propofol 1% according to Schnider's model (0.6-1 μg/mL).**

Our experience is in agreement with literature data, which reports this procedure as feasible and safe, depending on the anesthesiologist skill in the pharmacological titration, as well as his sensitivity to maintain a close psychological contact with the patient throughout the surgical procedure, which is one of the key challenges for a successful outcome.

Conflicts of interest

The authors declare no conflicts of interest.

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