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CASE REPORT

Anesthetic Management with Dexmedetomidine During the Awake Craniotomy Surgery: A Case Report

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ABSTRACT

Objective: Awake craniotomy is a procedure of choice when the area to be resected is close to the eloquent regions of the cerebral cortex. In this case report, the anesthetic technique in the awake craniotomy case presented.

Case Presentation: A 62 years old female was scheduled for awake craniotomy procedure. Anatomically, the tumor involved the motor tracts of the right hand. Following the intravenous access and monitorization of the patient, 4.5 mg midazolam and 50 mcg of fentanyl used for sedation of the patient and dexmedetomidine was used for maintenance. We used Bispectral Electroencephalogram Index in order to measure the deepness of sedation during the surgery. Desaturation and hypercapnia on the arterial blood gas analysis seen following the addition of 3 mg of midazolam to deeper the sedation after hemostasis. The dose of dexmedetomidine increased and flumazenil administered to reverse the midazolam.

Discussion: Dexmedetomidine belongs to alpha-2 adrenergic agonist group, which acts through its sedative effects at the locus coeruleus. Different from GABA, alpha-2 adrenoreceptors produce sedation without the entire spectrum of stupor letting patients stay somnolent and easily awakened with verbal stimuli becoming compatible to be tested. In conclusion, dexmedetomidine is one of the possible choices of medication for awake craniotomy as it maintains the patient's convenience, reduces analgesic needs, and level of deliberateness without any confusion and agitation.

Keywords: Awake craniotomy, conscious sedation, dexmedetomidine, midazolam

INTRODUCTION

Awake Craniotomy procedure requiring verbal communication with the patient during the procedure demands a unique approach of the anesthesiologist and this is the procedure of choice when the area to be resected is close to the eloquent regions of the cerebral cortex.

Dexmedetomidine is the medication of choice with its pharmacokinetic properties like rapid distribution half-life being approximately 5-6 min and an elimination half-life of approximately 2 hours [1,2]. The first case report introducing the successful use of dexmedetomidine for awake craniotomy was performed by Bekker et al. in 2001 [3]. Later on, Souter et al. [4] published several cases indicating the successful use of dexmedetomidine and its combination with fentanyl. In this paper, we reported the anesthetic technique in the awake craniotomy case where dexmedetomidine hydrochloride was used in combination with fentanyl and midazolam for the procedure and cortical mapping.

CASE REPORT

A 62 years old, 56 kg female with right parietal lobe glial tumor was scheduled for awake craniotomy procedure. On the preoperative assessment of patient besides hypertension regulated with valsartan + hydrochlorothiazide and the history of cholecystectomy operation under general anesthesia, nothing remarkable was found. Her physical status was evaluated as ASA (American Society of Anesthesiologists) II. Anatomically, the tumor involved the motor tracts of the right hand and on physical examination of the patient right-hand weakness and writing difficulty was detected. During the procedure as well as patient's hand movement and motor functions were also controlled.

No premedication was administered to the patient. After the acceptance to the operating room, the patient was monitored with a pulse oximeter, electrocardiogram, radial arterial line for invasive blood pressure and axial skin temperature. The deepness of sedation was measured with bispectral electroencephalogram index (BIS) monitor. EMG monitorization was also performed for the assurance of cranial nerves. Foley catheter was inserted and urine output was monitored. The patient was positioned in the supine position. Following the patient's acceptance to the operating room and the intravenous access with 20G and 18G intracaths, 4.5 mg midazolam and 50 mcg of fentanyl used for a sedation of the patient. Dexmedetomidine initial loading dose of 1 mcg/kg was administered for 10 minutes and then 0.3 mcg/kg/hour as the maintenance dose of infusion. The scalp nerves were blocked bilaterally with 60 mg 0.5% bupivacaine and 240mg 2% prilocaine. Desaturation and hypercapnia on arterial blood gas analysis (SpO_2 = 88% and $PaCO_2$ = 47mmHg) occurred when the sedation level deepered with IV injection of 3 mg of midazolam following the hemostasis. For reversing the effects of midazolam and not to use a laryngeal mask airway (LMA), 0,5 mg flumazenil injected intravenously and then sedation level deepered by increasing the infusion dose of dexmedetomidine. During the operation, the BIS index varied between 70 and 90. We observed heart rate about 60-70 bpm, optimum blood pressure levels and body temperature between 36.0 to 36.5 °C during the procedure. For this report, writen informed consent was obtained from the patient.

DISCUSSION

There are different anesthesia techniques from local to general used for language mapping and tumor resection during an awake craniotomy. Dexmedetomidine represents a different criterion in anesthesia. Dexmedetomidine belongs to alpha-2 adrenergic agonist group which acts through its sedative effects at the locus coeruleus. Different from GABA, alpha-2 adrenoreceptors produce sedation without the entire spectrum of stupor letting patients stay somnolent and easily awakened with verbal stimuli becoming compatible to be tested [5].

The common inconvenience when dealing with awake surgery is anxiety. Due to the reduction of sympathetic responses to stress at the central and peripheral nervous system 0,2-0,7 mcg/kg/hour dexmedetomidine has a strong anxiolytic effect. Undeniably, we see that patients on this drug were less anxious than expected. The dose of 0.3 mcg/kg/hour dexmedetomidine, in this case, produced an optimal somnolence. In contrast to other studies, we had neither significant hemodynamic instability nor bradycardia in our case.

During an awake craniotomy procedure, pain control is one of the most important tasks. While retracting the temporal muscle and deattaching of cranial bone from dura mater near the temporal fossa, patients feel pain, which requires an increase in analgesia. Anesthetic rearrangement may cause drowsiness and as right after the craniotomy, brain mapping should be done, before the verbal testing patient may need some time for recovery which may affect the total time of surgery. However, using dexmedetomidine as the main agent decreases the need for other analgesic drugs enabling neuropsychological assessment comfortable. In our case study, we used totally 100 mcg of Fentanyl as an analgesic agent.

In our case, we did not monitor any significant oxygen desaturation or hypercapnia except the second bolus dose of 3 mg midazolam in accordance with the literature. The brain kept appropriate for microsurgery by controlling fluid balance and sufficient spontaneous ventilation with no need to use a laryngeal mask airway.

During the awake craniotomy procedure, the risk of convulsions increases leading anesthetists to be

prepared for the treatment of convulsive incidents. Although there is no evidence describing human cases, it has been proved that dexmedetomidine decreases the convulsion threshold in animal models (6). We did not face any seizures in our case.

CONCLUSION

In conclusion, dexmedetomidine is one of the possible choices of medication for awake craniotomy as it maintains patient's convenience, reduces analgesic needs, and level of deliberateness without any confusion and agitation. Although the usage of dexmedetomidine as a sole source causes no significant respiratory depression and does not require LMA, but it should be taken into account that in combination with midazolam it may lead to respiratory depression as well as saturation decrease.

Author contribution

Study conception and design: SU, Mİ and TR; data collection: Mİ and TR; analysis and interpretation of results: Mİ and TR; draft manuscript preparation SU, Mİ and TR. All authors reviewed the results and approved the final version of the manuscript.

Ethical approval

Ethical approval is not required.

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Conflict of interest

The authors declare that there is no conflict of interest.

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