Alfentanil Mediated Activation of Epileptiform Activity in the Electrocorticogram During Resection of Epileptogenic Foci

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ABSTRACT: Purpose: Alfentanil is a potent, short-acting opioid agent which has been used during balanced anaesthesia in children undergoing the surgical excision of epileptic foci. After the observation that this agent had the potential to induce epileptic seizures, we questioned the frequency of this occurrence in this group of patients. Method: Twelve patients (6 males, 6 females) undergoing surgical excision of an epileptic foci were prospectively followed. For each patient an electrocorticogram was recorded for 30 minutes before and after receiving alfentanil 20 μg/kg intravenously. The frequency of epileptiform abnormalities before and after drug administration was evaluated. When the electrocorticogram no longer showed the effects of alfentanil administration, methohexital 0.5 μg/kg was given intravenously. Results: Alfentanil induced significant activation of epileptiform discharges among 83% of these patients. Twenty-five per cent had an electrographic seizure. In comparison, methohexital induced significant activation of epileptiform discharges in 50% of these patients. None experienced electrographic seizures. Conclusions: As alfentanil can induce electrographic seizures in patients known to have epilepsy, caution is advised in its use in this group of patients.

Unlike in the adult, the resection of epileptogenic foci in a child with epilepsy often requires general anaesthesia. At our institution we have used balanced anaesthesia (halothane or isoflurane, nitrous oxide, narcotic agent and a non-depolarizing muscle relaxant). Initially alfentanil appeared to be a narcotic agent that was well-suited for this procedure, as it has a rapid onset of action and a short duration of action.1 With rapid onset and elimination of this drug, we had hoped that there would be minimal effect on the electrocorticogram.

Recently we observed seizure-like activity after a patient who was undergoing surgery of the excision of epileptogenic foci received alfentanil during the induction phase of the anaesthesia. Based on this observation and a case report of alfentanil inducing a seizure in the literature,2 we decided to further evaluate the role of this drug in children and adolescents undergoing surgery for excision of epileptogenic foci.

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METHOD

Twelve consecutive patients undergoing surgical resection of epileptic foci were prospectively followed. All had partial epilepsy which had proven refractory to standard anticonvulsant medication. Surgical excision of the epileptic focus was considered the best treatment option. All had extensive pre-operative electrographic and imaging studies in attempt to localize the area of epileptogenic abnormality. All patients had their regular anticonvulsant medications discontinued at least one week prior to their surgery. A general anaesthetic consisting of 0.2-0.4% halothane or isoflurane, 70% nitrous oxide, and a non-depolarizing muscle relaxant was administered in all cases. The volatile anaesthetic agent was discontinued 20 minutes before doing electrocorticographic recordings.

Following the surgical exposure of the brain, twenty electrocorticographic electrodes were placed on the exposed brain over the area of surgical interest. The electrocorticogram was recorded using a Nihon Kohden 21 channel electroencephalographic recording machine. A baseline electrocorticogram was recorded for 20 minutes. Alfentanil 20 μg.kg⁻¹ intravenously was then given. Once the electrocorticographic recording had returned to baseline, methohexital 0.5 μg.kg⁻¹ intravenously was administered. Electrocorticographic recording was continued for a further 20 minutes after the methohexital administration.

The tracings were reviewed by the same electrocephalographer in the operating room at the time of the surgical procedure and again at the time the data were being reviewed for possible publication (several months later). Activation of epileptiform activity was considered significant if there was greater than or equal to 50% enhancement of this activity after administration of the drug when compared to the baseline recording. Electrographic seizures were stated to have occurred if there was constant epileptiform activity for greater than 60 seconds.

RESULTS

Twelve patients (six males and six females) between the ages of 15 months and 17 years were included in this review. Alfentanil activated epileptiform abnormalities in ten patients (83%) of which three (25%) had evidence of electrographic seizures. The epileptiform abnormalities appeared within five minutes of the administration of the drug. The morphology and initial localization of discharge was unchanged when compared to the baseline tracing. Muscle relaxation prevented any movement during these electrographic seizures. In contrast, six patients (50%) had activation of their epileptiform abnormality after receiving methohexital. No patients had electrographic seizures recorded after receiving this drug. No differences in location of the epileptiform abnormalities were seen in those cases in which activation occurred with both drugs.

DISCUSSION

Seizure-like activity during or after induction of anesthesia with fentanyl, sufentanil and alfentanil has been reported.2-7 Electroencephalographic confirmation of the epileptic origin has been missing in these reports. Smith et al.8 reported on forty-six cases in which seizure-like activity was associated with narcotic anaesthetic agents. The seizure-like activity was recorded elec-
patients undergoing surgery for the removal of epileptogenic tissue in patients with chronic epilepsy. This drug has the ability to induce clinical seizures in patients with underlying epilepsy. Caution in using alfentanil in patients with epilepsy or neurological handicaps is advised.

REFERENCES