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Sevoflurane-induced Epileptiform Electroencephalographic Activity and Generalized Tonic–Clonic Seizures in a Volunteer Study

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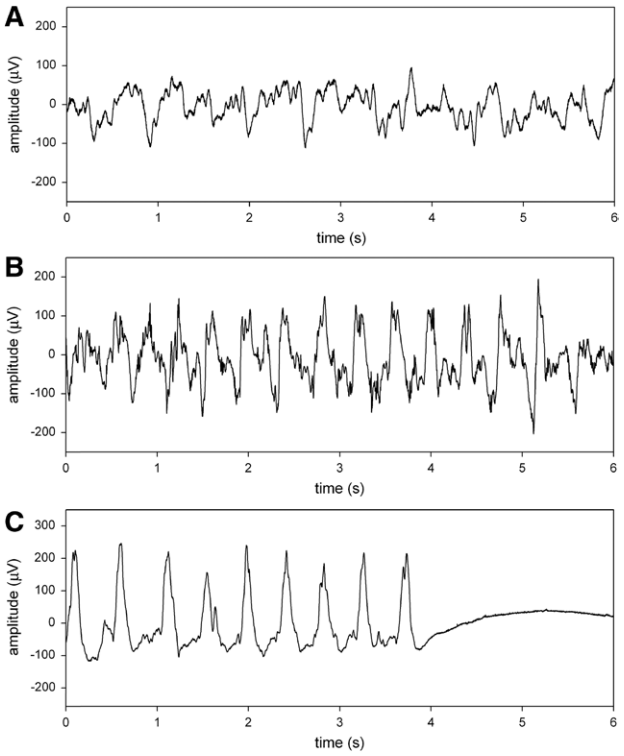

AFTER approval of ethics committee, a healthy, unpremedicated man (21 yr) without history of seizures took part in a volunteer study[1] of the effects of anesthesia on electroencephalogram (figs. A–C). During sevoflurane induction, the patient showed convulsions without epileptogenic electroencephalographic activity (fig. A, corresponding end-tidal gas concentration 1.24 vol%; effect-site concentration 1.01 for K^{eo} $T^{1/2}$ of 150 s). At further increase of end-tidal gas concentration to 4.15 vol% (effect-site concentration 3.96), a generalized tonic–clonic seizure was observed as defined by clinical diagnosis and electroencephalographic pattern (fig. B). It ceased after 35 s when sevoflurane was stopped and propofol was given as rescue medication. Consecutively, the transition from seizure activity to suppressed electroencephalographic activity was observed (fig. C; end-tidal gas concentration 3.08 vol%; effect-site concentration 3.94). The patient recovered completely. Further examinations remained without findings.

Convulsions during sevoflurane anesthesia have been reported with an incidence of 5%.[2] Subclinical electroencephalographic activity during induction of anesthesia with sevoflurane has been demonstrated in 20% of children[2] and in 47% of adults[3] with spontaneous breathing, increasing with controlled hyperventilation and hypocapnia to 88% and 100%, respectively. Our case represents the first documentation of a generalized tonic–clonic seizure in a nonepileptic patient triggered by sevoflurane with ongoing recording of confirming electroencephalographic pattern. Indices derived from processed electroencephalogram may show aberrant values during seizure activity, mostly indicating falsely high index values because of high-frequency epileptiform activity. Therefore, it is crucial for anesthesiologists to directly assess the raw signal when electroencephalogram-based monitors are used.

References

1. Horn B, Pilge S, Kochs EF, Stockmanns G, Hock A, Schneider G: A combination of electroencephalogram and auditory evoked potentials separates different levels of anesthesia in volunteers. Anesth Analg 2009; 108:1512–21
2. Vakkuri A, Yli-Hankala A, Särkelä M, Lindgren L, Mennander S, Korttila K, Saarnivaara L, Jäntti V: Sevoflurane mask induction of anaesthesia is associated with epileptiform EEG in children. Acta Anaesthesiol Scand 2001; 45:805–11
3. Yli–Hankala A, Vakkuri A, Särkelä M, Lindgren L, Korttila K, Jäntti V: Epileptiform electroencephalogram during mask induction of anesthesia with sevoflurane. ANESTHESIOLOGY 1999; 91:1596–603

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