

BACKGROUND

- Seizure-like activity occurs infrequently with general anesthesia
- Definition: Uncontrolled electrical activity in the brain
 - May produce a physical convulsion and/or thought disturbances
- Ddx: idiopathic, drug-induced, metabolic, electrolytes, traumatic, withdrawal
- Anesthetics may suppress neuronal transmission via GABA and other receptors ³
- Seizures have been reported upon induction of anesthesia ²
 - Sevoflurane more epileptogenic than desflurane or isoflurane
 - Risk factors: high sevoflurane concentration, rapid induction and female gender
- Paucity of literature documenting the occurrence of intraoperative seizures while under general anesthesia

REFERENCES

- Liang, P. Sevoflurane activates hippocampal CA3 kainate receptors (GluK2) to induce hyperactivity during induction and recovery in a mouse model, British Journal of Anaesthesia, Nov 2017, Pgs 1047–1054.
- Mohanram, A. Repetitive generalized seizure-like activity during emergence from sevoflurane anesthesia, Canadian Journal of Anesthesia, Aug 2007, Pgs 657-661.
- Niu B, Xiao JY, Fang Y, Zhou BY, Li J, Cao F, Tian YK, Mei W. Sevoflurane-induced isoelectric EEG and burst suppression: differential and antagonistic effect of added nitrous oxide. Anaesthesia. 2017 May;72(5):570-579. doi: 10.1111/anae.13843. Epub 2017 Mar 8. PubMed PMID: 28272748; PubMed Central PMCID: PMC5413860.
- Burbridge MA, Jaffe RA, Doufas AG, Lopez JR. Intraoperative Tonic-Clonic Seizure Under General Anesthesia Captured by Electroencephalography: A Case Report. AA Case Rep. 2017 Jul 1;9(1):9-12. doi: 10.1213/XAA.0000000000000509. PubMed PMID: 28410260.

CASE PRESENTATION

- HPI:**
 - A 14-year-old healthy male, 80 kg, who presents for distal femoral osteotomy.
- Intra-Op:**
 - Induction of general anesthesia:
 - Fentanyl, midazolam, propofol and rocuronium
 - Uneventful placement of pre-surgical femoral nerve block with 20 ml of 0.25% Bupivacaine
 - General anesthesia maintained with an exhaled sevoflurane concentration of 2.3%
 - No hemodynamic response to incision and commencement of periosteal dissection
 - After the dissection:
 - Patient developed generalized tonic-clonic shaking (with sparing of the blocked LLE)
 - Not preceded by hemodynamic changes
 - Within 30 secs, bolus of 50 mg of propofol and the movements ceased
 - EEG or BIS was not available for intra-operative analysis of brain function
 - Discussion with surgeons: estimated surgical time was additional 2-3 hours
 - Case cancelled and the patient emerged uneventfully with no seizures on emergence
 - Pt did not report awareness during anesthetic
- Post-Op:**
 - No further tonic-clonic activity observed in PACU or POD #1
 - Neurology was consulted for further management → workup was negative

DISCUSSION

Differential of intraoperative tonic-clonic movements

- Insufficient anesthesia
 - Tachycardia and/ or hemodynamic instability not observed
- Local anesthetic toxicity: seizures
 - Dose given < toxic dose
 - Onset of symptoms was quite delayed
- Drug interactions versus withdrawal: seizures
 - Denied medications, recreational drugs and alcohol use
- Sevoflurane-induced seizures:
 - Generalized tonic-clonic movements reported w/ induction and emergence in patients without a seizure disorder
 - Isoelectric EEG unlikely at 2% sevoflurane ³
 - Ongoing research about mechanism of inhaled anesthetics needed
 - In vitro research: sevoflurane hyperactivity might be mediated through kainite receptors ¹

Intra-operative Diagnostic Tools

- EEG- ideal but requires additional staff for interpretation
- BIS- more prevalent, no literature on how to interpret seizures

Management

- No published guidelines on management of intra-op seizures
 - Airway, breathing, circulation
 - Propofol, midazolam, lorazepam, anti-epileptics
- Post-op workup
 - CBC/CMP/glucose, LFTs, urine toxicology panel
 - Continuous vitals
 - Continuous EEG
 - Brain CT/MRI