Medications that Can Cause Serotonin Syndrome

Antidepressants:
- SSRIs
- SNRIs
- TCAs

Analgesics:
- Fentanyl
- Tramadol
- Meperidine
- Methadone

Antiemetics:
- Metoclopramide
- Ondansetron

MAOIs:
- Isoniazid
- Linezolid
- Selegiline
- Methylene blue

Over the counter:
- St. John’s wort
- L-tryptophan
- Diet pills
- Dextromethorphan

Symptoms and Treatment of Serotonin Syndrome

- Restlessness
- Insomnia
- Tremor
- Nausea and vomiting
- Mydriasis
- Agitation
- Sweating
- Hyperreflexia
- Inducible clonus
- Occular clonus
- Sustained clonus
- Autonomic dysfunction
- Rhabdomyolysis
- Confusion/disorientation
- Death

Discontinue offending agent
Supportive therapy
Benzodiazepines
Fluid therapy for hypotension
Consider cyproheptadine
Propanolol for tachycardia
Invasive monitoring
Hemodynamic support
Cooling measures
Treatment of DIC
Intubation and paralytics

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A Case of Delayed Emergence In PACU: Serotonin Syndrome, Psuedoseizure, or Normal Teenage Behavior

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17-year-old 50 kg female scheduled for upper endoscopy for dysphagia.
- PMHx: pseudoseizures, autism, anxiety, depression, and sleep disturbances.
- Medications: desvenlafaxine 100mg, amitriptyline 50mg.
- Day of procedure: held desvenlafaxine, took amitriptyline night prior.
- Uneventful anesthetic: Inhalational induction followed by placement of LMA which was removed deep.
- Received propofol, fentanyl, dexamethasone, ondansetron, and ketorolac.
- In PACU, patient unarousable for 2 hours after arrival.
- Exam: VSS, not responding to commands, resisted eye-opening, mydriatic pupils, clenched fists, ankle clonus.
- Discharged home 4 hours after anesthetic, sleepy but following commands.
- Drowsy at home for 24 hours post-anesthetic.
- Postoperative pharmacogenomic testing: Patient is a CYP2C19 rapid-metabolizer and CYP2D6 poor-intermediate metabolizer.

Severe serotonin syndrome (SS) is a life-threatening emergency leads to multiorgan system failure, rhabdomyolysis, DIC, etc.
- Mild & moderate serotonin SS are often underdiagnosed and commonly mistaken for other anesthetic emergencies.
- SS is a clinical diagnosis causing neuromuscular, autonomic & mental status changes.

- Fentanyl, meperidine, tramadol, ondansetron, and metoclopramide increase synaptic serotonin and may cause serotonin toxicity.1
- Differential Diagnosis: Malignant hyperthermia, neuroleptic malignant syndrome, anticholinergic syndrome.
- Perform careful history and physical examination and rule out residual anesthetics that may mask common signs and symptoms of SS.1, 2
- Follow-up pharmacogenetic testing: CYP2C19 rapid-metabolizer & CYP2D6 poor-intermediate metabolizer
- Amitriptyline converts to nortriptyline (active metabolite) via CYP2C19.
- Nortriptyline converts to hydroxy-nortriptyline (less active metabolite) via CYP2D6.
- Patient is at risk of experiencing increased side effects from amitriptyline.3

The number of pediatric patients taking serotonergic medications is increasing.
- Individual pharmacogenetics may influence clinical response.
- Pediatric anesthesiologists should be well-versed in triggering medications, clinical presentation, and treatment of SS.

REFERENCES