

Emergence Delirium, PTSD and Effects of Anesthesia

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Objectives

- Identify vulnerable populations who require closer assessment of risk factors for the development of emergence delirium.
- Describe the stages of anesthesia and the mechanism of emergence delirium based on practice evidence
 - Understand the implications for the patient with PTSD
- Identify 3 strategies to mitigate risk for the development of emergence delirium in the PACU setting

Principles of Delirium

- Brain function is best considered another 'vital sign'
- Delirium is considered acute brain dysfunction or 'brain failure'
- Non-specific sign of medical illness
- Most common 'psychiatric disorder' in the general hospital setting
- Estimated to affect more than 2.3 million older hospitalized patients annually
- Cost of care is 2.5 times higher than care for those patients without delirium

Subtypes of Delirium

- ***Hyperactive***: characterized by agitation, restlessness and attempts to interfere with medical equipment
- ***Hypoactive***: characterized by withdrawal, apathy, flat affect, lethargy and decreased responsiveness
- ***Mixed***: characterized by a fluctuation between hyperactive and hypoactive
- Emergence delirium less often identified and nonetheless equally harmful to the patient

Emergence Delirium

- Also known as *Emergence Agitation*, this well researched yet poorly understood phenomena is specific to the anesthesia experience.
- It is noted in the immediate post-operative period (first 15-30 minutes after surgery) in about 5% of post-operative patients
 - Pediatric Population: prevalence is 12-13%
 - Older (over age 70) Adult Population: 10-15%
 - Patients with psychiatric conditions (e.g., depression, anxiety and/or drug dependency)

Signs and Symptoms

- Excitement alternating with periods of lethargy
- Followed by periods of excitement and disorientation
- May demonstrate reactive behaviors of screaming, kicking, and swearing/cursing
- Generally do not respond appropriately or accurately to commands
- May manifest primitive reflex responses in the presence of CNS dysfunction

Physiologic Causes of Emergence Delirium

- Arterial Hypoxemia
- Hypercapnia (primary)
- Hypoglycemia
- Hyponatremia
- Hypothermia
- Airway obstruction
- Gastric dilatation
- Full bladder
- Electrolyte imbalance
- Pain
- Sepsis
- Alcohol withdrawal
- Intracranial injury
- Sensory overload
- Sensory deprivation
- Embolism

Pharmacological Causes of Emergence Delirium

- Ketamine
- Droperidol (Inapsine)
- Benzodiazepines
- Metoclopramide
- Atropine
- Scopolamine
- Use of analgesics
- Midazolam
- Remifentanyl
- Propofol
- Barbiturates
- Use of sevoflurane or isoflurane or a combination of both

Additional Risk Factors

- Type of surgery: hip, abdominal, cardiac, ophthalmological, breast, or other ENT
- Duration and type of anesthesia
- Re-operation
- Fear of loss of function or disfigurement
- Alcohol abuse
- Sleep deprivation
- Malnutrition
- Pain
- Extremes of age
- Pre-existing cognitive dysfunction

Vulnerable Populations: Children and Adolescents

- Literature is limited to case series and case reports (neglected subject of research in this population)
- *Predisposing Factors*: young age (pre-school age), male gender, pre-existing cognitive impairment, pre-existing behavioral or emotional problems (anxiety), mental retardation, physical illness, caregiver anxiety or caregiver absence (e.g., acute separation anxiety)
- *Precipitating Factors*: vulnerability felt to be secondary to fever, toxic or metabolic insults, traumatic brain injury and hypoxia; and emerging rapidly from general anesthesia

Vulnerable Populations:

Older Adults

- Emergence delirium may be prolonged and may not evidence until later (8-24 hours later)
- More sensitive to adverse effects of certain anesthetic agents and analgesic drugs thought to be related to decrease in cholinergic activity seen in the physiologic changes of aging
- Metabolize medications at a slower rate
- Presentation may appear more restless with behavioral regression (e.g., verbally abusive, infantile behavior) as opposed to change in physical behavior

Sources: Burns, 2003; Hudek, 2009; Slor et al., 2011

Vulnerable Populations

- Individuals with anxiety and depression at higher risk
- More likely in patients who are anxious about surgical findings and outcomes
- History of intra-operative awareness during surgery is associated with the development of anxiety, depression, nightmares, insomnia and PTSD as adverse consequences.
- Individuals with PTSD

Vulnerable Populations: Post Traumatic Stress Disorder

- History of PTSD should be considered a risk factor in the assessment of every patient
- In patients with intra-operative awareness, a predictor for PTSD was perioperative dissociation
- More likely to be highly combative during emergence due to psychomotor agitation
- More prevalent in combat veterans compared to noncombat troops or civilian populations

Sources: Gross & Stern, 2014; Lovestrand et al., 2013; Shoum, 2014; Wilson, 2014 and Umholtz et al., 2016

Understanding PTSD

- Most people will experience stress-related reactions following a traumatic event
- When the reactions don't go away (symptoms lasting longer than 3 months) and become disruptive to daily living it is identified as PTSD
- Individuals with PTSD often experience anxiety, depression and difficulty with substance use patterns (ineffective coping)
- Characterized by 'dysregulated stress systems' at the physiological level (neuroendocrine and immunological)

Sources: Lovestrand et al., 2013; McLott et al., 2013; Moye & Rouse, 2015; Seng, 2003

Symptoms of PTSD

- ***Re-experiencing***: reliving the event often triggered by a sight or sound (nightmares, intrusive thoughts, flashbacks)
- ***Avoidance***: tendency to avoid circumstances or situations that may serve to trigger a flashback; can lead to dissociation
- ***Emotional Numbing***: feeling ‘nothing’, disinterest or interpersonal detachment
- ***Persistent Arousal/Hyperarousal***: always on guard for danger, poised to act to protect oneself, irritability, hypervigilant

The Possible Link...

- When a person with PTSD feels threatened, an overwhelming fear can trigger the fight-or-flight response and loss of inhibition
- May lead to hyperarousal/hyper-reactivity, a condition thought to arise from the brain's amygdala (central to the fear response and emotional memory)
- Anesthetics alter amygdalocentric neurocircuitry to produce amnesia and sedation
 - Patient unable to retrieve information or consider situational context
- New model may explain why noxious stimuli at emergence may activate uninhibited amygdalocentric neurocircuitry
 - With the loss of 'top-down' inhibition, given the stimulation of the thalamus, a hyperactive hypothalamus (responsible for excitatory activity in an unconscious patient) may result in emergence delirium

Reactive Aggression

- Reactive Aggression: impulsive reaction to a perceived threat of danger
- This impulsive aggression is initiated by activation of the amygdala with the reaction directed at the source of the perceived threat
- ‘Motoric Aggressive Responses’ similar: flailing of arms, attempts to escape, and combative to others
- Increased anxiety is related to higher levels of aggression

Background on Anesthesia

- A 'controlled reversible state'
- Includes unconsciousness, skeletal muscle relaxation and suppression of reflexes
- Desired effects: LOC, analgesia, immobility and amnesia
- The anesthetic plan depends on patient, procedure, prior anesthetic reaction and current medications
- The agent selected is dependent on the amount of desired sedation and the side effect profile.

Anesthesia

- There are 3 types of Anesthesia
- **Local Anesthesia:** mild, localized to numb a small area
- **Regional Anesthesia:** often combined with a small dose of a sedative to desensitize a large section of the body by injecting drugs into the spine to block nerve signals to the brain
 - Only enough sedation to make the patient less aware and responsive

General Anesthesia

- ***General Anesthesia***: often a combination of drugs rendering patients unconscious
 - Prevents patients from moving
 - Blocks memories of surgery
 - Thought to be related to interrupting neuronal activity thereby disrupting communication between regions of the brain leading to unconsciousness
- ***Emergence*** is the transition through the four stages of anesthesia

Source: Burns, 2003; and Storrs, (2014)

Stages of Anesthesia

- Stage I: *Induction* to LOC, amnesia
- Stage II: *Excitation*, delirium; hypertension, tachycardia, dilated pupils, uncontrolled movements
- Stage III: '*Surgical anesthesia*', adequate depth, constricted pupils, absent movement
- Stage IV: '*Overdosage*', hypotension, shallow or absent respiration, dilated non-reactive pupils

Additive Effects of Anesthesia

- Providers agree that emergence delirium is related to the type of anesthetic used (67%)
 - Potent inhalational agents (87%)
 - Ketamine (64%)
- Brain neurocircuitry involved with anesthesia
 - Changes in gene and protein expression contribute to neurotoxicity
 - Exposure to anesthesia and surgery may accelerate latent pre-existing neurocognitive disorders

Understanding Emergence Delirium: Pharmacologic Factors

- Residual effects of anesthetic agents
 - Blockade of muscarinic cholinergic receptors (CNS)
 - CNS depression
 - Stimulation of muscarinic receptors
 - Blockade of dopamine receptors as a result of extrapyramidal effects
 - Increased use of ketamine which produces more dissociative effects such as amnesia and other psychotic symptoms

Sources: Burns, 2003; Gross & Stern, 2014; and Wilson, 2014

Best Practices for the Management of Emergence Delirium

- Proper identification of the patient at risk by obtaining thorough history
 - Older adults may be vulnerable to PTSD when medical diagnosis/treatment cause traumatic stress creating new burden
- Review of medications (be alert to meds used for nightmares)
- Use the principle of consistency in staffing (e.g., a familiar face)
- Consistent use of valid assessment scale
 - Richmond Agitation Sedation Scale (RASS)
- Ruling out possible causes for delirium
 - Physiological
 - Pharmacological (give only what is needed)

Sources: AACN Practice Guidelines, 2016; Hudek, 2009; Lovestrand et al., 2013; Moye & Rouse, 2015; Shoum, 2014; and Wilson, 2014

Best Practices

- Pre-operative patient education to reduce anxiety
 - Balance detail and how information is presented to the patient based on learning assessment
 - Pre-operative teaching has been shown to reduce anxiety with an opportunity to become familiar with the hospital setting and any planned procedures
- Plan for voluntary use of physical restraints as a prudent intervention
 - Educate patient and apply with their consent as a means to keep them safe during emergence

Best Practices

- Environmental management necessary to optimize the experience of emergence to avoid a fear-conditioned response
- Minimal stimulation; remember that hearing is the first sense to return during emergence
- Reality orientation in a calm environment may assist a smooth transition through emergence to wakefulness
- Benefit of Child Life when working with children and adolescents

Sources: Hudek, 2009; McLott et al., 2013

Best Practices

- Intraoperative/intra-procedural therapies
 - Where possible avoid anesthetic techniques the induce LOC or disorientation
 - Intraoperative sympatholytic therapy (consider clonidine, dexmedetomidine, droperidol, promethazine)
- Working knowledge of PTSD symptoms and therapies to diminish risk of evoking flashback in the perioperative period
 - No need to avoid use of ketamine when PTSD is known in history, just use what is needed to achieve effect

Best Practices

- Individualized plan of care
 - Consider developmental needs and preferred learning style
 - While balancing stimulation, some providers identify that talking to their elderly patients during regional anesthesia may be more effective than monitoring blood pressure and heart rate when gauging depth of anesthesia
 - Consider the role family or caregiver may play in calming or soothing the patient
 - How is the patient vulnerable based on the history of anesthesia exposure which may contribute to the patient slipping more deeply into unconsciousness thereby increasing the risk for delirium?



In Closing...

"Nurses are natural warriors. Not warriors in the ways of aggression, but rather warriors of non-aggression - people who bear witness to the suffering of others and try to alleviate it."

Vidette Todaro-Francheschi

Closing Pearl

“It’s not about being the best; it’s about being a little better today than you were yesterday.”

Slovak proverb

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