

Intraoperative Recall

Risk

- Incidence in USA: 20 million anesthetics annually

Perioperative Risks

- Incidence is approximately 0.1% in general surgical population and increases to approximately 1% in high-risk populations.
- Procedure risk factors include OB surgery, cardiac surgery, trauma, and rigid bronchoscopy.
- Pt risk factors include prior awareness, significant CV disease, COPD, substance abuse, chronic opioid use, and chronic benzodiazepine use.
- Anesthetic risk factors include absent/low benzodiazepine premedication, absent/low halogenated agent, and dense NM blockade.

Worry About

- PTSD is a common sequela (up to 50% incidence).
- Awareness caused a significant fraction of closed claims against anesthesia personnel (1.9–12%).

Assessment Points

System	Effect	PE	Test
CV	Htn Tachycardia		BP ECG
RESP	Tachypnea Bronchospasm Decreased compliance	Observation Auscultation	Respiratory rate PIP
CNS	Increased sympathetic tone Spontaneous movement	Lacrimation Diaphoresis Observation	Processed EEG, bispectral index End-tidal agent monitoring Postop interview

Key References: Mashour GA, Avidan M: Intraoperative awareness: controversies and non-controversies, *Br J Anaesth* 115(Suppl 1):i20–i26, 2015; Brice DD, Hetherington RR, Utting JE: A simple study of awareness and dreaming during anesthesia, *Br J Anaesth* 42(6):535–542, 1970.

Perioperative Implications

Preinduction, Induction, and Maintenance

- Counsel all pts about risk of awareness as part of routine consent process.
- Consider benzodiazepine premedication in all pts without contraindication; titrate dose to clinical effect.
- Avoid muscle relaxant if not indicated. If needed, titrate to avoid dense paralysis.

Monitoring

- Consider use of processed EEG monitoring in high-risk pts, especially those receiving total IV anesthesia.
- Keep inhaled agent ≥ 0.7 MAC with audible alarms in high-risk pts.
- Continue to monitor NM blockade.

- Many cases are preventable and identified as attributable to lapses in technique.

Overview

- Explicit recall: Conscious, articulable recollection of events when intended to be unaware.
- Implicit recall: Change in behavior attributable to perception of intraoperative events, but no explicit awareness. Much harder to study.
- Intraoperative awareness: Consciousness during presumed general anesthesia; does not necessarily lead to postoperative recall.
- Hemodynamic changes are neither sensitive nor specific signs of awareness.
- Processed EEG monitoring (such as BIS) may decrease incidence of awareness.
- Maintenance of adequate end-tidal halogenated agent (≥ 0.7 MAC, age adjusted) using audible alarms may decrease incidence of awareness.

Etiology

- Inadvertent awake paralysis usually due to drug labeling or administration error
- Other awareness frequently associated with light anesthesia: Intentional, unintentional, or equipment malfunction

Usual Treatment

- Discuss incident with pt postop.
- Offer psychiatric referral to all pts with recall as screening or treatment for PTSD.
- Preliminary work suggests that glucocorticoids may reduce development of PTSD when administered shortly after a traumatic event; consider administration in PACU if explicit recall is reported there.
- Benzodiazepines are not effective in producing retrograde amnesia; cannot use for rescue of awareness.

General Anesthesia

- Consider redosing induction agent or using inhaled agents if time between induction and securing airway is prolonged.

Regional Anesthesia

- Counsel pts that awareness during regional anesthesia is expected, even with sedation.
- Limit incidental and alarming conversation during surgery with regional or any other anesthetic technique.

Postoperative Period

- Many pts with recall will not spontaneously report recall in the recovery room. Structured interviews

reveal more cases. Serial interviews may improve surveillance further.

- Structured interview for recall:
 - Last thing remembered before sleeping?
 - First thing remembered after awakening?
 - Anything in between?
 - Remember any dreams?
 - Worst thing about anesthetic?

Anticipated Problems/Concerns

- High risk of serious psychiatric sequelae

Jaundice

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Risk

- Chronic liver disease consistently the ninth most common cause of death in USA
- Male to female ratio: 2:1
- African American to Caucasian ratio: 2:1

Perioperative Risks

- Jaundice per se poses no special risks; at least 25% present with severe pruritus.
- Risks are associated with coexisting or underlying conditions.
- Use of regional anesthesia limited by coagulopathy and ascites.

Worry About

- Biliary obstruction

- Chronic liver disease:
 - Hepatopulmonary syndrome and hypoxemia
 - Portopulmonary Htn
 - Hepatorenal syndrome
 - CV dysfunction (cirrhotic, alcohol)
 - Infection, protein-malnutrition
 - Encephalopathy (hepatic and alcoholic); cerebral edema
 - Portal Htn:
 - Esophageal varices (incompetent lower esophageal sphincter)
 - Ascites; renal dysfunction
 - Low systemic vascular resistance and hyperdynamic circulation
 - Bleeding
 - Inability to extubate at end of surgery

- Altered drug pharmacodynamics and pharmacokinetics
- Renal impairment
- Universal precautions
- Invasive monitoring

Overview

- Mostly unconjugated-excess production:
 - Hemolytic anemias (e.g., sickle cell anemia, β -thalassemia major)
 - Extravascular hemolysis (tissue infarction, large hematoma, hemorrhage into tissue, postoperative jaundice)
 - Ineffective erythropoiesis: Decreased hepatic uptake
 - Drugs (e.g., flavaspidic acid, novobiocin, some cholecystographic dyes)
 - Severe, prolonged fasting: Decreased conjugation