Encephalopathy, Postanoxic

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Risk

- After successful prehospital cardiac resuscitation: 59–65% of pts remain comatose.
- 0–5% of successful resuscitations result in chronic vegetative state.

Perioperative Risks

- Worsening of neurologic status; blindness most common residuum.
- Postpone surgery in all but emergency situations.
- Do what is necessary to treat precipitating cause and to decrease sequelae (e.g., treat elevated ICP).

Worry About

- Repeat of events that initially caused encephalopathy (e.g., arrhythmias leading to cardiac arrest)
- Hypotension, hypercapnia, hypoxia, and sepsis that can exacerbate encephalopathy

Overview

- Brain injury resulting from prolonged period of insufficient cerebral oxygenation.
- Clinical picture ranges from mild confusion to brain death.
- Chances for acceptable neurologic recovery: 1% with continued coma after 24 h and lack of two of the following reflexes: Pupillary, corneal, and oculovestibular.
- Absence of brainstem function 72 h after event associated with irreversible coma.
- Therapeutic hypothermia (especially after cardiac arrest with initial VFIB or VTach) improves neurologic outcome.
- Good prognosis seen in 50% of pts awakening within 24 h of insult.
- Seizures occur in 25% of pts.
- Anoxic damage may have been sustained by other organs (e.g., MI, shock liver, acute renal failure, stress ulcers, ARDS).
- DI is poor prognostic sign.

Etiology

- Caused by inadequate O_2 delivery to CNS due to inadequate cardiac output, resp dysfunction, severe anemia, and/or increased ICP
- Most often secondary to primary cardiac (MI or arrhythmia) or pulm (asthma, pulm embolism) event
- May also be result of CO poisoning, suffocation, and cyanide poisoning

Usual Treatment

- Prevent recurrence of inciting event.
- Ventilatory and hemodynamic support as needed.
- Therapeutic hypothermia to 32–34° C for 12–24 h.
- Stress ulcer prophylaxis.
- Treatment of seizures (with anticonvulsants, e.g., phenytoin) and myoclonus.
- BP should be maintained at normotensive or mildly elevated levels in normotensives and higher in hypertensives.
- Treat fever promptly with antipyretic drugs.

Assessment Points

System	Effect	Assessment by Hx	PE	Test
CV	MI	Assess if cardiac disease was cause of arrest		ECG, other cardiac assessment Troponins, CK
RESP	ARDS	Assess if resp disease was cause of arrest Resp failure	Wheezing, stigmata of COPD	Pre-arrest PFTs ABGs
GI	Shock liver Stress ulceration	Hx of GI bleeding	Jaundice	AST, ALT, bilirubin, alkaline phosphatase Hct NG output
RENAL	Renal failure	Assess if lyte abnormality or acidosis caused initial event	Urine output	BUN/Cr
CNS	Altered mental status, diffuse and focal neurologic abnormalities	Changes in neurologic signs since hypoxic event, seizures	Neurologic and mental status exams, apnea test, brainstem reflexes	CT scan/CT angiography, MRI/MRA EEG SSEP, BAER
MS	Myoclonus, posturing Contractures	Abnormal movements, posturing Prolonged immobility	Decerebrate or decorticate postures, myoclonus Contractures	

Key References: Lippa CF, Moonis M: Generalized anoxia/ischemia of the nervous system. In Irwin RS, Rippe JM, editors: *Intensive care medicine*, ed 7, Philadelphia, PA, 2012, Wolters Kluwer/Lippincott Williams & Wilkins, pp 1768–1771; Topjian AA, Berg RA, Taccone FS: Haemodynamic and ventilator management in patients following cardiac arrest, *Curr Opin Crit Care* 21(3):195–201, 2015.

Perioperative Implications

Preoperative Preparation

- Assess and document neurologic function and mental status.
- Review cause of anoxic event.
- Assess damage to other organs.
- If pt hypothermic, beware of possible increased blood loss.

Monitoring

- If arrest was due to cardiac arrhythmias or MI/ischemia or if pt is hemodynamically unstable, may need specialized monitoring

Airway

- Assess potential for aspiration: Gag reflex and ability to cough and clear secretions.

Induction

- Avoid succinylcholine.

Maintenance

- Must consider that pts may have pain perception and will require analgesia.
- Do what is appropriate to decrease sequelae (e.g., treat increased ICP); therapeutic hypothermia.
- If being treated with therapeutic hyperthermia drug, clearance is reduced.

Extubation

- If unable to maintain patent airway or sustain adequate minute ventilation, pt should remain intubated.

Adjuvants

- Avoid long-acting anesthetics so that neurologic status can be assessed soon after surgery.
- Avoid drugs that decrease seizure threshold.

Anticipated Problems/Concerns

- Repeat of events (e.g., arrhythmias) that initially led to anoxic encephalopathy.
- Worsening of neurologic condition during periop period.
- Seizures and myoclonus.
- Postpone all but emergency surgery if fluctuating neurologic deficits or acute encephalopathic condition exists.

Endocardial Cushion Defect (Atrioventricular Canal)

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Risk

- 4% of all congenital heart disease and 0.3–0.4:1000 live births
- 40–50% of AV canal defects are associated with trisomy 21

Perioperative Risks

- Paradoxical air embolism
- Shunt reversal (from left to right to right to left) because of vasodilating volatile and IV anesthetics (reduced systemic vascular resistance)
- Endocarditis; prophylactic antibiotics for pts with a complete repair or a jet lesion
- Arrhythmias after AV canal repair
- Reactive pulmonary vasculature and PAH