Disclosures

I have no commercial relationships to disclose.

Outline

1. Steps to evaluating the comatose patient
   • Definition of states of altered consciousness
   • Misconceptions
   • Causes of altered mental status
   • Physical exam and testing
2. Prognosis
   • Anoxic coma
3. Communication with the family

Definitions

Consciousness

Wakefulness

Awareness

Coma

• Absence of wakefulness and awareness
• Eyes are closed
• Motor activity is reflexive rather than purposeful or defensive
• Sleep-awake cycles are absent
• Duration: 1h to 2-4 weeks
The anatomy of coma

- Ascending reticular activating system (ARAS)
- Bilateral cerebral hemispheric lesions
- Combination of ARAS and cortex
- Bilateral thalamic Lesions

Definitions

Terminology

- Somnolence
- Lethargy
- Obtundation
- Stupor

Consciousness

- Coma
- Vegetative State
- Persistent Vegetative state
- Brain Death

• Somnolence
• Lethargy
• Obtundation
• Stupor
The portrayal of coma in contemporary motion pictures

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While the portrayal of coma in motion pictures is often graphic and realistic, the reality of coma in critically ill patients is much different. Many patients who enter a coma have a grave prognosis and may never awaken. This is a common misconception. The actual process of awakening from coma is not sudden and does not occur with intact cognition. The long-term recovery from coma is often slow and may take years to accomplish. The majority of patients who enter a coma have a grave prognosis and may never awaken.

Misconceptions

- State of deep sleep
  Eyes closed and beautifully groomed
  Awakening is sudden and with intact cognition

Coma

- Grave prognosis with a mortality of 40-50% for TBI and 54-88% for anoxic injury
- Awakening after years of “coma” is rare and those patients were likely on MCS, PVS or unrecognized locked-in syndrome
- Pts who have awaken from MCS or PVS have severe disabilities
Steps to evaluation

1. Is the patient in a coma?
2. What is the cause of the alteration of consciousness?
3. What does the exam tell us about the cause and the prognosis?
4. Which ancillary tests are likely to help?

Initial stabilization

- Look for
  - Hypoventilation
  - Hypoxia
  - Hypoglycemia
  - Hypotension
  - Acute structural pathology of the brain

ABC

- Draw ABG, CMP, Glucose, CBC, Toxicology Screen
- Mannitol, hypertonic saline adm if ICP crisis suspected
- Thiamine and glucose
- Naloxone if narcotic OD is suspected
- Flumazenil if benzodiazepine OD suspected
- Activated charcoal if drug intoxication suspected
- Head CT if structural cause suspected
- Detailed History and physical examination
- Consider EEG, LP, MEE
**Causes of altered consciousness**

**Wide Net Approach:**
- VITAMINS P
- 1. Vascular
- 2. Infectious
- 3. Trauma
- 4. Autoimmune
- 5. Metabolic/Medicines
- 6. Iatrogenic
- 7. Neoplastic
- 8. Seizures
- 9. Psychiatric

**Common Suspects:**
- Traumatic brain injury
- Hypoxic-ischemic (HIE)
- Drug overdose
- Ischemic stroke
- Intracranial hemorrhage
- CNS infections
- Brain tumors

**Neurological exam**

- Quick survey
- Level of consciousness
- Respiratory pattern
- Cranial nerve examination
- Motor examination

**Respiratory pattern**

A. Cheyne-Stokes
B. Hyperventilation
C. Apneustic breathing
D. Ataxic breathing
E. Apnea
Pupils

- Can be helpful especially for:
  - Brainstem problems
  - Drug intoxications
    - Opiates
    - Anticholinergics
    - Sympathomimetics

Motor examination

- Localizing motor dysfunction
  - Vascular
  - Tumors
- Increased rigidity
  - Neuroleptic malignant syndrome
- Catatonic posturing

Additional Testing

- CT scan useful to ruled structural causes of coma but un-revealing on toxic metabolic coma and early HIE
- MRI should be done on pt with unexplained coma and normal or equivocal CT findings
Additional Testing

Lumbar Puncture

• CT head w/o contrast before LP

• Useful if infectious or inflammatory etiology is suspected

Additional Testing

• To make diagnosis, EEG is requisite.
  – Up to 10% of patients in an unexplained coma in ICUs have seizures or status epilepticus.

Prognosis

• Can help families make decisions about continued medical care

• Financial and emotional implications for families

• Burden on the healthcare system

• Must patients should be supported for a least 3 days
Prognosis

- Use common sense
- Prognosis depends on the etiology.
- Patients with toxic-metabolic etiology do better than those with structural lesions.
- Traumatic better than anoxic injury.
- A longer duration correlates with decreased likelihood of a meaningful neurological recovery.

Predictors

- Anoxic Time
  - Correlates with poor outcome in a large population.
  - Doesn’t discriminate between poor outcome and good outcome in an individual patient.

- Elevated body temperature
  - Correlates with poor outcome in a large population.
  - Doesn’t discriminate between poor outcome and good outcome in an individual patient.

- EEG- Burst suppression
  - Correlates with poor outcome in a large population.
  - Closer to predicting outcome than the first two but not a good enough discriminator.
Predictors

- Pupillary response and corneal response at 1 to 3 days
- Myoclonic status epilepticus in first day.
- Neuron-specific enolase (NSE) levels >33 μg/L in serum

Somatosensory Evoked Potentials

- Anoxic Brain Injury (N=1136) 29% Awakened
  - SSEP absent (N=336) 0% Awakened
  - SSEP Present (N=800) 41% Awakened
  - SEP abnormal (N=310) 22% Awakened
  - SEP abnormal (N=481) 52% Awakened
Confounding factors

- Multiorgan failure
- Intubation
- Cardiogenic shock
- Major metabolic derangements
- Sedatives and neuromuscular blockade
- Induced hypothermia

Coma

Exclude confounders

- Brainstem reflexes?
  - Yes: Brain death/Testing
  - No: Poor outcome

- Day 1: Microcoma SE
  - Yes: Poor outcome
  - No: Poor outcome

- Day 1-3: SSEP
  - Yes: Poor outcome
  - No: Poor outcome

- Day 1-3 NSE >33ug/L
  - Yes: Poor outcome
  - No: Poor outcome

- Day 2: Absent pupillary or corneal reflexes, Extensor or absent motor response
  - Yes: Poor outcome
  - No: Poor outcome

- Indeterminate outcome

What are the limitations of what we know?
Communicating the prognosis

• What is the question?
• What does the family know already?
• How is communication with the family going to be accomplished?
• What the definition of poor outcome?
Communicating the prognosis

• Establish a relationship with the family early
• More than one schedule meeting is generally required
• Ask about advance directives
• Find out what the patient has described as an acceptable outcome.
• Center all discussions around the patient wishes and needs

Communicating the prognosis

• Mold your discussion around likelihood of getting to an acceptable outcome to the patient
• Answer questions for the family but keep it simple.
• Present clear options about the next step in the plan of care.
• Address DNR status!!!
• If asked what you would do in this situation... 

Conclusions

• Coma is a transitional state that carries a grave prognosis
• Initial evaluation and treatment is aimed at identifying the cause and preventing secondary brain injury
• Accurate prognostication is possible in patients with TBI and HIE
• Communication with the staff, other physicians and the family is paramount
Thank you