GSC & Brain Death: Diagnostic Criteria

Anesthetic Pearls: Anesthetic Implications of GCS & Brain Death Criteria

1. Glascow Coma Scale (GCS)

The Glascow Coma Scale is used to evaluate the neurologic status of patients with a brain injury (closed or penetrating head injuries) and to evaluate the response to therapeutic interventions. GCS relays information primarily about the level of consciousness as opposed to the papillary response to light and the oculocephalic/vestibular reflexes which provide information about brainstem function. It defines neurologic impairment in terms of three types of responses; eye opening, motor response, and verbalization. A patient with no neurologic function would be assigned a score of 3 and a "normal" patient has a score of 15. The exam is valid only in normothermic patients whom are not intoxicated and have not been given central nervous system depressants. The neurologic examination and assignment of a GCS score should be repeated 6 hours after injury when it may have a greater prognostic value. Patients with a post-resuscitative score of less than / equal to 8 are classified as having sustained a severe head injury, 9-12 a moderate head injury, and 13-15 mild head injury.

2. Brain Death Determination

- "Irreversible cessation of all function of the entire brain, including the cortex and brain stem, as determined in accordance with accepted medical standards."
- Cortical brain death is indicated by unconsciousness, no spontaneous movement, or no response to noxious stimuli.
- Brain stem function is absent when reflexes or functions of the brainstem are therefore not present. Examples include loss of response to rising $C0_2$ (apnea test) and loss of primitive cranial nerve function (cold calorics, dolls eyes, corneal reflex).
- Determination of brain death is a clinical diagnosis but may be supported by further studies such as electrical silence on the EEG and absence of cerebral perfusion on studies of cerebral blood flow
- Irreversibility must be present and is established by a lack of improvement in the examination or clinical supportive studies over a 12-24 hour period. Potentially reversible factors must be ruled out: drug intoxication, hypothermia, metabolic encephalography, shock, and post-ictal states.
- The potential for infants and children to recover from neurologic insults is less predictable and therefore requires an experienced pediatric neurologist to make this determination.

Brain Death Criteria

1. Cerebrocortical function
   - Unconscious
   - Loss of spontaneous movement
   - Unresponsive to external (noxious) stimuli
2. Brain stem function
   - Cranial nerve reflexes absent
     - Corneal reflex
     - Papillary light reflex
     - Oculocephalic reflex
     - Occulovestibular reflex
     - Atropine resistance
   - Respiratory reflex absent
3. Supporting clinical studies
   - Cerebral blood flow
     - Cerebral angiography
     - Transcranial Doppler
     - Xenon-enhanced computed tomography scan
     - Electroencephalography

Glasgow Coma Scale for Head Injury

Glasgow Coma Scale, Eye opening	
Spontaneous	4
To loud voice	3
To pain	2
None	1
Verbal response	
Oriented	5
Confused, disoriented	4
Inappropriate words	3
Incomprehensible sounds	2
None	1
Best motor response	
Obeys	6
Localizes	5
Withdraws (flexion)	4
Abnormal flexion posturing	3
Extension posturing	2
None	1