Traumatic Brain Injury

Causes: Falls, Motor Vehicle Crash, Struck by/against events, Assaults
Glasgow Coma Scale classification
Mild brain injury: GCS 13-15
Moderate brain injury: GCS 9-12
Severe brain injury: GCS 3-8

Primary Injury: Resulting from a direct injury to the brain resulting in tissue injury. Examples: skull fracture or epidural hematoma.

Secondary Injury: Resulting from pathophysiologic changes that occur as a result of the primary injury. These injuries compound the damage and reduce compensatory mechanisms. Examples: hypotension, cerebral edema, increased ICP, hypoxia.

Contact (Blunt) Injuries: Primary injuries result of an object striking the head resulting in injury at area of impact or below area of impact.

Coup-contrecoup: ("coup" = blow)
Injury at point of impact as well as opposite side of brain.

Penetrating Injuries (missile injury):
Gunshot, knife, bone fragments
Damage will depend on velocity (low=bone fragment, high=gunshot wound)

Scalp Injuries:
Abrasions: scraping away of top layer…..slight bleeding
Nursing: clean it up (saline irrigation, exploration)
Contusion: bruise to the scalp
Nursing: ice, x-ray to r/o fracture
Laceration: wound or tear in the tissue, usually bleeds profusely
Nursing: direct pressure, clean it up, suture and aseptic management

Skull Fractures: Can cause brain injury as well. Need to watch for CSF leakage.
Linear fracture: (simple fracture) Thin lines or cracks. Insignificant unless underlying brain trauma occurs. May have headache and possible decreased level of consciousness.
Nursing: observation
Depressed fracture: depression of bone fragments into brain. May have headache, decreased level of consciousness, palpable depression of skull over the fracture site.
Nursing: debride, elevate and remove bone fragments with cranioplasty.

Basilar fracture: occurs in bones over the base of the frontal and temporal lobes. Not always observable with x-ray but may be manifested by ecchymosis around the eyes (**raccoon eyes**) or behind the ears (**Battle's sign**) or by blood or CSF leakage from the ear (**Otorrhea**) or nose **(Rhinorrhea**).

Nursing: Most CSF leaks resolve spontaneously (7-10 days). Surgery and antibiotics, neuro checks) Check for **Halo sign** (blood encircled by yellowish stain on pillow or linens.

Cerebral Injuries

Concussion: A diffuse brain injury. No break in the skull or dura. "Shake the brain violently." Frequently from acceleration/deceleration or direct blow injuries.
S/S: loss of consciousness for 5 minutes or less. Usually a momentary loss of reflexes, amnesia of the event, H/A, drowsiness, confusion, dizziness, and maybe visual disturbances, may be nausea and vomiting.

Mild= no loss of consciousness.

Postconcussive syndrome: May occur days or months after the head trauma. S/S: persistent headache, dizziness, attention deficit, irritability, insomnia, depression, impaired judgment. Usually will resolve over several over several weeks.

Contusion: bruising on the surface of the brain. Most common locations are the frontal or temporal lobe. Clinical effect dependent upon size, and effect of related edema. Edema and bleeding peak 18 to 36 hours after injury. Intracerebral hematomas may result. S/S: altered level of consciousness; behavior, motor, or speech deficits; abnormal posturing; increased ICP.

Diffuse Axonal Injury: Most dangerous and difficulty to treat. Wide spread damage to axons in white matter from high speed acceleration-deceleration associated with MVA's. May involve brainstem and reticular activating system which will result in prolonged coma.

Mild: loss of consciousness lasting 6-24 hours with short term disability.

Moderate: coma lasting less that 24 hours with residual disability on awakening that usually does not get better.

Severe: injury to the brain stem, posturing, prolonged coma, hypertension and fever, increased ICP, excessive sweating.

Focal Cerebral injuries

Epidural hematoma: Collection of blood between skull and dura.

- Often associated with skull fractures, especially temporal or parietal area that lacerate the middle meningeal artery.
- Bleeding (usually arterial) separates dura from the skull
- S/S: loss of consciousness followed by lucid period (may be days), followed by loss of consciousness and deterioration neurologically until coma. May be severe headache, sleepiness, dizziness, contralateral hemiparesis or hemiplegia, abnormal posturing, unilateral fixed and dilated pupil on same side as the hematoma.

Subdural hematoma: blood (usually venous) collecting in subdural space between the dura and the arachnoid layer of the meninges. Frequently associated with acceleration/decleration forces resulting in direct injury to brain tissue and diffuse axonal injury.

- Acute: 24-48 hours
- S/S: gradual or rapid deterioration in level of consciousness.
- Sub-acute: 2 days to 2 weeks
- Chronic: 2 weeks to several months (often client does not remember event). Those at high risk for developing a chronic subdural hematoma are the elderly, those taking anticoagulants, and chronic alcohol abusers.

Intracerebral hematoma: bleeding directly into brain tissue. Can result in a significant mass that leads to increased ICP. Most common sites are frontal and temporal lobes.

- General treatment for ICP management and perhaps surgery if needed.
- S/S: Progressive decline in level of consciousness, headache, increased ICP, pupil abnormalities, contralateral hemiplegia.