Injuries to the head and spine

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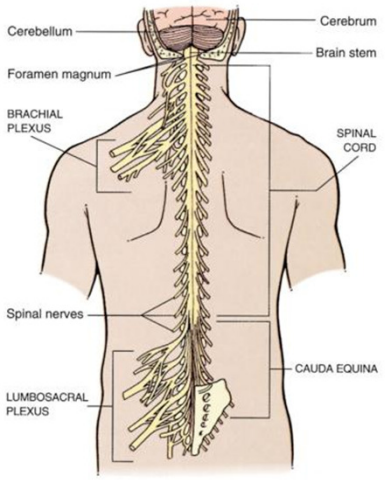
Nervous System

- Two sub-systems
  - **Central Nervous System ("CNS")**
    - **Brain and spinal cord**
  - Peripheral Nervous System
    - 12 cranial nerves and nerve pairs that exit the spinal cord

Peripheral Nervous System



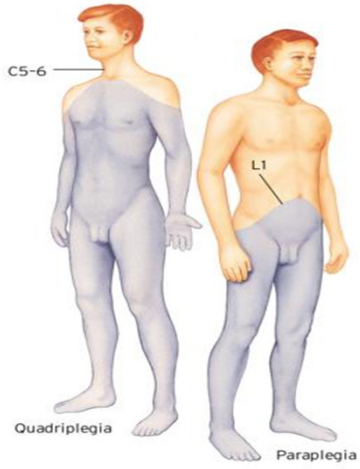
Nervous System -- 2

- **Autonomic Nervous System**
  - **Controls involuntary functions**
    - **E.g. heartbeat, breathing**
  - Sympathetic nervous system
    - Flight & Fright response
    - Speeds up heart functions
  - Parasympathetic nervous system
    - Feed & Breed response
    - Slows heart functions

Nervous System -- 3

- Motor branch
  - Transmits messages from brain to muscles
- Sensory branch
  - Transmits messages from body to brain
- Spinal cord is the "relay" to the brain
  - ***Therefore, if there is damage at a particular level of the spinal cord there is no communication from <u>below</u> that level to the brain***
- ***Nerve tissue is unique as it does not regenerate***

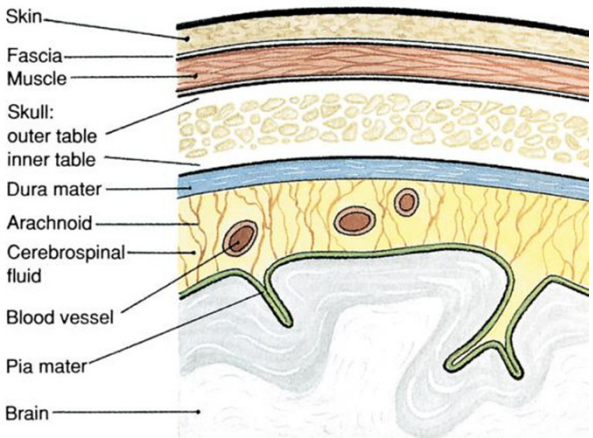
Spinal Cord Injuries



Review of anatomy

- Skull
  - Cranium, facial bones, mandible, maxilla, zygoma, orbits, nasal bones
- Foramen
  - Hole where the spinal cord exits the brain
- Cerebrospinal fluid (CSF)
  - Fluid that bathes and cushions the brain and spinal cord
- Spine has 33 vertebrae
- Spinous "process"
  - Bony bumps that can be "palpated" (felt)
- Meninges
  - Dura mater
  - Arachnoid
  - Pia mater

Layers in the head



Injuries to the brain and skull

Scalp injuries

- Very "vascular"
  - **Will bleed a lot**
- Can look worse than it may be
- Dress like any other STI
- **Do not apply pressure if skull fracture is suspected**

Skull injuries

- Includes fractures of cranium and face
- Can be open or closed

Brain injuries

- Can be direct or indirect
- **Direct**
  - Open injuries where brain is injured by bone fragments
- **Indirect**
  - Shock of impact to skull is transferred to brain
- **Whenever a skull or brain injury is suspected *treat for spinal injury as well!***

Signs and Symptoms

- Visible bony fragments, deformity
- **Altered mental status (AMS) – Most Reliable sign**
  - **Decreased LOC**
- Sever localized pain at the site
- Battles sign / Racoon eyes
  - Late sign – not usually seen in the field
- **Unequal size pupils**
- **Blood or CSF from nose or ears**

Battles Sign

Racoons eyes

Unequal pupils

Signs and Symptoms - 2

- **Cushings Reflex**
  - Increased BP, decreasing pulse rate
- **Projectile vomiting**
- "Posturing"
  - Decorticate
  - Decerebrate
- **Seizures**
- Paralysis

Treatment

- **ABCs**
  - **Monitor for changes in breathing "pattern"**
- **Assume and treat for spinal injury**
  - Rigid Cervical Collar ("C-Collar")
  - Appropriate extrication
- O_2 via NRB or BVM as needed
- Control bleeding
- Manage for shock – unusual, unless…
- **Watch for vomiting**
  - Creates an airway risk

Specific brain injuries

- Concussion
  - Mild injury
  - No detectable brain damage
  - Brief LOC
  - Headache
  - Amnesia
    - Retrograde vs. antegrade
  - Patient may be groggy

Specific brain injuries - 2

- Contusion
  - Bruising of the actual brain tissue
  - May have LOC
  - May have AMS

Hematomas

- Collection of blood within tissue
- Three types of hematomas
  - Subdural
  - Epidural
  - Intra-cranial

Subdural Hematoma

- Blood between the brain and dura
- Slow venous bleed
- **May take hours, days or *weeks* (especially in the elderly) before s/s appear**
- **WARNINGS!**

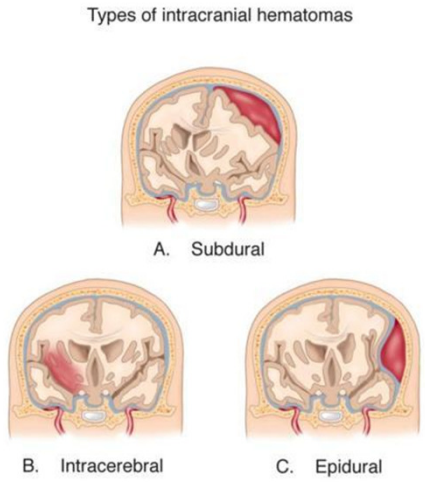
Epidural Hematoma

- Blood between the dura and skull
- Caused by a rapid arterial bleed
- **Hallmark sign:**
  - **Unconsciousness followed by a "brief lucid interval" followed by unconsciousness**

Intra-cerebral hematoma

- Bleeding in the brain itself

Hematomas



Good to know

- The greater the extent of injury, the poorer the patient outcome
- Stabilize any impaled objects
  - **Shorten them as needed**
- Facial fractures
  - Blood and swelling may cause challenging airway problems

Injuries to the spine

- Can be obvious or occult
- Often become apparent when patient moves
- **Suspect spinal injury when a significan "mechanism of injury" (MOI) exists**
  - ***Even without pain or physical findings***
- e.g. MVA, diving accidents, falls from a height, "pedestrian vs. vehicle"

Signs and Symptoms

- **Paralysis – most reliable sign**
- Pain without movement
- Pain with movement
- Tenderness along spine
- Impaired breathing in "high cord" injuries

Signs and Symptoms - 2

- Deformity
- Loss of bowel or bladder control
- Weakness in extremities
- Posturing
- Priaprism

Treatment

- In line stabilization upon patient contact
  - **Tell your patient what you are doing!**
- Assess ABCs
- Rapid assessment of head and neck
  - **Then apply C-Collar**
- Assess motor and sensory function in all 4 extremities
- Appropriate spinal immobilization
  - Based on patients condition
  - KED, rapid extrication to backboard…
- Hi-con oxygen
- **Reassess motor and sensory function**