EMT LESSON PLAN
THE NERVOUS SYSTEM
STRUCTURAL BREAKDOWN

- 3 READILY IDENTIFIABLE PARTS OF BRAIN:
  CEREBRUM (CORTEX, OUTLIER PART), CEREBELLUM, MEDULLA OBONATA. CENTER IS BRAINSTEM (NOT VISIBLE) PONS THALAMUS

- DESCRIBE FUNCTIONS OF EACH PART BRIEFLY

- CNS SURROUNDED BY MENINGES: DURA, ARACHNOID, PIA

- BLOOD/BRAIN BARRIER

- SENSORY PARTS OF NOSE + EYES PART OF CNS; NOTE CONTINUITY OF MENINGS, PROBLEM OF EASY SPREAD OF INFECTION VIA CSF.

- COMPOSED OF NEURONS AND GLIAL CELLS ("GLUE")

- NEURON PROCESSES FORM NERVES; BODIES FORM GANGLIA (PNs) OR NUCLEI (OR MANY OTHER TERMS, CNS)

- O2 AND GLUCOSE REQUIREMENTS: CNS CANNOT USE FATS, ONLY GLUCOSE, AND CNS HAS LIMITED GLUCOSE STORES. PERFUSION FOR 4-10 MIN = BRAIN DEATH.

- BRAIN SURROUNDED BY CAVITIES; IT IS NOT EXPANDABLE.

- BRAIN CONNECTED BY CSF, SECRETED AT A SPECIAL FILTRATE OF BLOOD INTO THE VENTRICLES (HOLES IN BRAIN); EVENTUALLY GOES BACK INTO BLOOD INTO VENOUS SINUS THROUGH ARACHNOID VILLI IN MID-SKULL SINUS

- CNS NEURONS CANNOT RECONSTITUTE (EXCEPT, RARELY, THOSE IN SPINAL CORD)

- BUT, PNS NERVES CAN RECONSTITUTE (WHY?)

- OPENINGS IN SKULL:
  - TENTORIUM SUPPORTS CORPUS CALLOSUM
  - NASAL TURBINATE IS NOTH THROUGH WHICH
  - BLOOD GOES
  - FORMATION MAXILLARE: NOSE IN BONE HOLE
  - SPINAL CORD
- CRANIAL NERVES
**SPINAL CORD** - TRACTS OF NEURONS FROM BRAIN.
- PART OF CNS, STILL MÖNNERS
- SPINAL ROOTS: MOTOR-SENSORY
- BRAINSTEM: SENSORY PROJECTIONS (AND SIMILAR ANATOMY)
- SWITCHING OVER FROM COG AT VARIOUS LEVELS IN CNS. TISSUE AT DIFF. LEVELS PAVOUSE DIFF. LATERALIZING SIGNS
- DORSAL N. ORIGINS
- REFLEX ARC

**FUNCTIONAL**
- FUNCTIONS OF SYMPATHETIC + PARASYMPATHETIC N.S.
- SYMPTOM VISCOAL/SPHINCTERIC

**INSURIES**

**SKELETON INJURIES**

**SKULL**
- CRANIAL BONES ARTICULATE IN SUTURES;
- OPEN VS. CLOSED INJ. (WHICH IS MORE DANGEROUS? WHY?... EXPOSED; NONVITAL FOR PRESSURE TO CUR.)
- SITES OF FX:
  - COMMINUTED
  - DEEPLY DILATED PUPILS (WHY? CRANIAL T.)
  - BLOOD OR CSF (STOP CSF FLOW? WHY?). NO,
  - CAN BE REPLACED EASILY, NOT ESSENTIAL
  - PROVIDES OUTLET FOR ↑ ICP.
  - "BATTLE'S SIGN": BROWNING OVER NASALID
  - "BLACK EYES"
  - LOOSE MAXILLA
  - "BLADE:" FX OF ORBIT
- THINK C-SPINE INJURY!
- DON'T SQUEEZE IN FIELD.
- TACT 2 OF SKELETAL H. NOT; BLEED OR SQUIRT.
2. Brain Injuries

Types
- Concussion: Brief neurological deficit, no sequela.
- Contusion: Diffuse brain dysfunction.
  - MIdline, fast.
  - Permanent herniation into III.
  - Subdural: Slow, venous bilaterally related deficit.
- Head and Brain I. P. don't cause shock.

- Signs of Brain I. P.
  - Why Paralysis = Pupils Dilated?
  - Hemiation through Incisura of Tentorium of Brain or the Brain
  - Example of Trauma Victim w/ "Lucid Interval!"

1. Unconscious ⇒ Conscious
2. H.A., LOC
3. P.P., M.R., R.
4. Ipsilateral Pupil Dil., III.
5. Contralateral Weakness (Cerebral Peduncle)
7. PT.

Emergency Care
- Don't Immerse Neck (CVA Good)
- Descend, Side, Head
- CSF Leaks: Let Drain (why?) (loose
  - Sterile Draping but Control Bleeding
  - Direct Pressure (can't obtain pressure)" + vertebral pressure;
  - Cervical Spine
  - Reposition of Cervical
  - Neuro Wound
  - Don't Remove Impaled Object (why?)
  - Direct Pressure
  - Hypercarbia ⇒ Vasodilation ⇒ ICP
  - 10-15% Hypothermia ⇒ I Metabolism, so VT
  - VS + Neuro Watch

ABC
- Bleading
- Vascular, Joint
- Description

- D2
- VT
3. CONCUSSION PROCEDURES

- NOT VIBRANT OR DULL
  A. J LOC 0, QUIT 2-3 HRS.
  B. NOTE FOR DANGEROUS SIGNS
    - PROGRESSIVE OR PROTECTIVE VOMITING
    - HOMOPHOBIA OR WEAKNESS
    - RESPIRATORY DIFFICULTY
    - SEIZURES
    - POST-CONCUSSION SYMPTOMS:
      - H/A
      - DIFFICULTY IN CONCENTRATION
      - APHASIA
      - FEW DAYS BLACKOUT VISION
      - H/A: TOUGHNESS, EXCITATION, MUSCLE FAVOUR
      - MENSTRUATION, SNEEZE, DROOL...? ASPIRIN
      - FEATURES: PSYCHOPHOBIC SPACE
      - CONVULSIVE SEIZURES: FROM ES IN KIDS, ECLAMPSIA; CVA, INJURY OR INFECTION OF BRAIN; EPILEPSY, HYPOTHALAMIC

TONE, RIGIDITY
CLINIC SPASMS, OR EXANOMA
HYPOXIA
POSTICUAL. RELAXATION

- Eq. J. GROVER, BITT STICK IF
  NECESSARY... POSTICUAL: COMA POS.
  PULL AWAY SHARP EDGES. DON'T
  RESTRAIN, OR FORCE BITT STICK

- STATUS EPILEPTICUS... SUSTAINED CLINIC
  ACTIVITY, NOODLES DRESS, ETC.
  - OPEN MOUTH, TONGUE, BEHIND JAW.
  - EPILEPTIC PET. OR GRAND MAST
    "AURA"
  - INFECTIONS OR MENINGITIS, ENCEPHALITIS
  - NEURAL RIGIDITY (ALSO FROM SUBARACHNOID
    BLEEDS)
  - CONTAGIOUS
    - POLOMYELOIDS: ASCENDING
    - CVA, THROMBOSIS, HEMORRHAGE, HYPOTHALAMIC
    - VASO-EMBOILISM SPASM... COMPRESSION OR
      TIE... VESSELS
      - POLYMYELOIDS
- S1 LE CVA: Sudden
  H/A
  Collapse; LOC
  Hemiparesis
  Facial Hemiparesis
  Orientation
  Apraxia (but may hear + understand)
  theat puffing
  ≠ Pupils
  Rapid, bounding pulse
  Dryness
  Secretions in Airways
  Drooling

- LOC

- Eye: PERRLA

5. Neuro Assessment

Perl Direct/Consensual

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From side: Audio Response

- EOM (Extraocular Eye Movement)
  (Impaired Bilateral Symmetry)
- Accommodation (Lack of Accommodation)
- Doll's Eye
- Motor: Face: Tongue, Forehead, Eyelids, Hands
  Grips & Feet
  Babinski

Pauses: Odometer 4:4:4 Decubitus 4
6. **Spine Injuries**

- **Spine Fracture ≠ Cord Injury**
- **Paradoxical Respiration**
  1. Spine
    - **Pain**
    - **Ribs**
    - **Arms Up**
    - **Neurogenic Shock**

7. **Facial Injuries**

- **Blood Clots**
- **Jaw Fracture**
- **Neck Flexion**
- **Laryngeal or Tracheal Fracture**
- **Soft Tissue Wounds:**
  - Cold for continuous up to 1 hour
  - Stabilize pressure dressing for open wounds
  - No ice, sternal dressing for open tissue
  - Save Amputation Pieces, How?
- **Face Fracture:** Standard Principles Apply
- **Neck Laceration:** Direct Pressure
  - Brain Has Collateral Blood Supply, So
  - Can Stop Flow In 1 Gauze
  - Avoid Air Movement From Cut Vena Prolong Pressure...Both Sides
  - L.Side, Prolongs Head
  - Trachea: Intubate, Calm, Down Sl

8. **Eye**
1. The nervous system may be broken down into parts in two different ways, structural and functional. The two major structural divisions are the central nervous system (CNS) and the nervous system (___). The CNS in turn consists of the ___ and the ___ nerves, and the other major part consists of the ___ nerves and the ___ nerves.

2. Two major functional divisions of the nervous system are the voluntary nervous system and the ___ nervous system (fight or flight; nerve trunk outside but parallel to the spine) and the ___ nervous system (vagal stimulation, Valsalva maneuver).

3. A reflex arc directly connects motor and sensory nerves through the spinal cord, but does not depend on the brain. True or False?

4. The brain and spinal cord are cushioned by a clear fluid called (___). This fluid is formed from blood (through the blood/brain barrier) by the choroid plexus in the ventricles of the brain. It flows through the CNS, then is reabsorbed by the blood through the arachnoid villi in the sagittal venous sinus.

5. The fluid described above is not necessary for CNS function, and is easily replaced. True or false?

6. Give two reasons (other than those given above) not to stop the outflow of clear fluid from the nose or ears of the head-injured patient.

7. List, from inside to outside, the meninges.

8. What is nuchal rigidity (a stiff neck, with inability to touch the chin to the chest) often a sign of?

9. Define:
   a. anesthesia
   b. paresthesia
   c. paralysis
   d. paresis
   e. hemi-paresis
   f. ipsilateral
   g. contralateral

10. A person with full nerve function in all extremities does not have an injury to the spine. True or False?

11. A patient presents with labored diaphragmatic breathing (paradoxical respiration). Where is the spine injured?

12. An unconscious patient has his hands over his head. Although they have been brought back down to his sides, they keep creeping or falling back to a position above his head. Should you backboard him? Why?

13. Describe the difference between the two types of epileptic seizures.

14. List several causes of convulsive seizures.

15. What commonly-known procedures are not appropriate for a person having a seizure?

16. What are the effects of hypoxia and hypercapnia in an alert person?

17. What effect does hypercapnia have on the blood vessels of the brain?

18. Should a patient with a CVA always be given O2? Why or why not?

19. What is aphasia? Can an aphasic patient ever understand what is being said around him?

20. List several signs and symptoms of increasing intracranial pressure.

21. Except in very rare instances, regeneration of the CNS does not happen. True or False?

22. What is the difference between concussion and cerebral contusion?

23. What is the cause of neurogenic shock?