Neurological Disorders 11/22/16

- Neurological Disorders
  - Tumors
    - Growth of non-functional cells.
    - 3 Types
      - Benign
        - Cells grow within their own membrane. Clear boundaries, can usually be removed surgically.
      - Malignant
        - No ‘border’ between cell and tissue. Infiltrating tumor, cancerous.
      - Metastatic
        - Cells coming from malignant tumors in other organs that reach the brain and develop.
    - Damage of tumors is caused by compression or infiltration.
    - Because neurons cannot divide, they are not responsible for tumors.
    - Gliomas
      - From glial cells, malignant, can be removed surgically and with radiations.
    - Meningiomas
      - From dura matter, benign
      - Malignant & benign -> compression
      - Malignant -> take up space, use up oxygen/glucose, destroy cells
  - Seizures
    - Uncontrollable spread of neural activity (excitatory), sometimes leading to convulsion. Recurring seizures =epilepsy.
    - Partial vs. Generalized
      - Partial
        - Focal + remain local. Can be simple (no loss of consciousness).
      - Generalized
        - The opposite, complex, involves whole brain losing consciousness.
    - Two Kinds
      - Grand Mal
        - Generalized seizure with convulsions.
        - Phases
          - Aura -> tonic phase (rigid, loss of consciousness) -> clonic phase
(convulsions, stop breathing, increase in inhibition) -> sleep

- Petit Mal
  - Absence seizures (generalized, complex). Stop of activity, unconsciousness.

- Epilepsy
  - Repeated seizures.
  - Primary damage in the temporal lobes (hippocampus, amygdala)(memories and emotions).
  - Status epileptics = repeated complex seizures without regaining consciousness.
  - Neural Substrate
    - Hippocampus, among other.
  - Excitotoxicity
    - Neuron death because of too much excitation through NMDA channels.
  - Treatments
    - Anticonvulsants (benzodiazepines, barbituates)
    - Surgery (side effects)
    - Vagus Nerve Stimulation (partial seizures)

- Stroke
  - ½ million strokes a year, age related.
  - Two Kinds
    - Hemorrhagic
      - Bleeding in the brain
    - Obstructive
      - Two Kinds
        - Thrombus
          - Growth of cells locally on the blood vessel.
        - Embolus
          - Starts somewhere else
          - Thrombus and embolus -> loss of oxygen and glucose, osmolarity variations, bacterial infections
        - Blood clot -> ischemia (loss of blood flow)
          - Hypoxia -> shortage of oxygen, prevented with aspirin
  - Strokes prevent permanent brain damage, they can be prevented:
    - Medications to reduce blood pressure
    - Brain surgery (on vasculature)
    - Antibiotics (embolus and bacterial infection)
    - Anticoagulant (prevent blood clot up to 9 hours after stroke)

- Causes of Strokes
- Plaques
  - Atherosclerosis
    - Build-up of material (cholesterol, calcium deposits) on walls of blood vessels.
  - Detected by angiography (X-ray of blood circulation)
  - Treated by surgery
  - Treatment of obstructive stroke: stent
- Rehabilitation After Stroke
  - Therapies depend on the type of brain damage (speech, motor impairments...)
  - Case of limb movement impairment:
    - Constraint induced therapy
      - Inducing brain plasticity by artificially ‘amputating’ or restricting movement in a good limb
- Brain Machine Interface
  - Linking neural activity to an external artificial device.
    - Perception: artificial eye
    - Motor: artificial hand/arm
- Developmental Disorders
  - Generally induced by viruses or drugs.
  - Result in non-viability or retardation.
  - Fetal alcohol syndrome
    - Affects axonal growth and synaptic plasticity. Low doses of alcohol during pregnancy are sufficient.