

CAUSES OF BRAIN DAMAGE (p.1)

1. Brain Tumors (“neoplasms”)

60-80% arise from local tissues

20% meningiomas

40% astrocytomas

< 1% of neural origin...why?

10% arise outside of brain/head tissues

20-40% metastatic tumors (e.g. lung, breast)

malignant (infiltrating) vs. benign (encapsulating) tumors

most malignant tumors are metastatic tumors

treatments: usually radiation, followed by surgical removal if possible

rarely use chemotherapy...why?

2. Cerebrovascular Disorders

most common cause of death/disability (along with Mis) in USA

intracerebral hemorrhage (a “stroke”)

aneurysm

AVM (arteriovenous malformation)

Secondary to hypertension

“penumbra”

treatments: surgical intervention, cool brain, wait until clots off, lower BP

cerebral Ischemia (lack of blood flow)

secondary to thrombosis, embolism, or arteriosclerosis

artiosclerosis vs. atherosclerosis

TIA (transient ischemic attack)

Treatments: anticoagulants, cool brain, angiogram (“rotorooter”)

“glutamate cascade” effects

when neuron(s) deprived of blood flow/O₂ --- neurons become more active ---as more Na⁺ and Ca⁺⁺ ions enter neuron --- release more glutamate --- neurons become even more active --- etc.

hyperactive neurons eventually die (maybe several days later, after stroke)

some brain regions more susceptible than others (e.g. hippocampus)

developing drugs that block the glutamate cascade (NMDA RS blockers)

BRAIN DAMAGE (p.2)

3. Open-Head Injuries

e.g. gunshot wound

localized effects

swelling in the brain (edema), bleeding

infection

treatments: stop swelling & bleeding, antibiotics, clean area, remove bone fragments, close up wound, skull plate

4. Closed-Head Injuries

e.g. forceful blow to head, hit head against windshield in moving car

more diffuse damage (“coup & contrecoup”)

swelling in brain a major problem, no where to go except out back of brain

internal hemorrhage (in subdural space, “subdural hematoma”)

contusion > concussion

multiple concussions --- dementias, increased risk for PD

5. Infections

usually spread from some other part of body (e.g. lungs) or from insect/
animal bite that introduces bacteria/virus to bloodstream

bacterial or viral

meningitis vs. encephalitis

bacterial infections often lead to cerebral abscesses

5-20% are fatal

20% of survivors exhibit noticeable neurological problems

e.g. sensory losses, motor paralysis/weaknesses, cognitive/emotional

e.g. Syphilis bacteria --- “general paresis”

e.g. viruses: Rabies, Polio, Herpes, Mumps, Measles

“Bovine Spongiform Encephalitis” (BSE)(virus or prion?)

“Jacob-Creutzfeld Virus”

BRAIN DAMAGE (p.3)

6. Neurotoxins

- e.g. heavy metal poisoning (lead, mercury)
- ethyl alcohol (ethanol) --- FAS, alcohol-related brain damage (thiamine)
- e.g. cleaning solvents
- e.g. organic pesticides

7. Genetic Factors (Neurodegenerative disorders)

Down's syndrome

PKU (phenylketoneuria)

Huntington's chorea

Tay-Sach's Disorder

Alzheimer's Disease

Parkinson's Disorder

Idiopathic Cerebellar Degeneration
Etc.

8. Other Topics Related to Brain Damage

role of a **Clinical Neuropsychologist** (vs. a Neurologist vs. a Neurosurgeon)

Recovery from brain damage

Regrowth of surviving neurons

Aided by Schwann cells; impeded by oligodendroglia

Implanting cadaver Schwann cell tubes, inhibiting oligodendroglia

Reorganization of existing neurons (incl. collateral axonal sprouting)

Blocking apoptosis, blocking glutamate cascade

Neurotransplantation of fetal tissue (xenotransplants, autologous transp.)

Neuromotor rehabilitation training

Do soon after injury, “force” S to use impaired body parts

BRAIN DAMAGE (p.4)

8. Other Topics (cont.)

Modifying factors: Age at injury

Handedness

Years of education/intelligence (“cognitive reserve”)

Health-related issues

Sudden vs. gradual injuries (e.g. gun shot vs. slow growing benign tumor)

Quality/quantity of health care

Social support network