Brain Tumor

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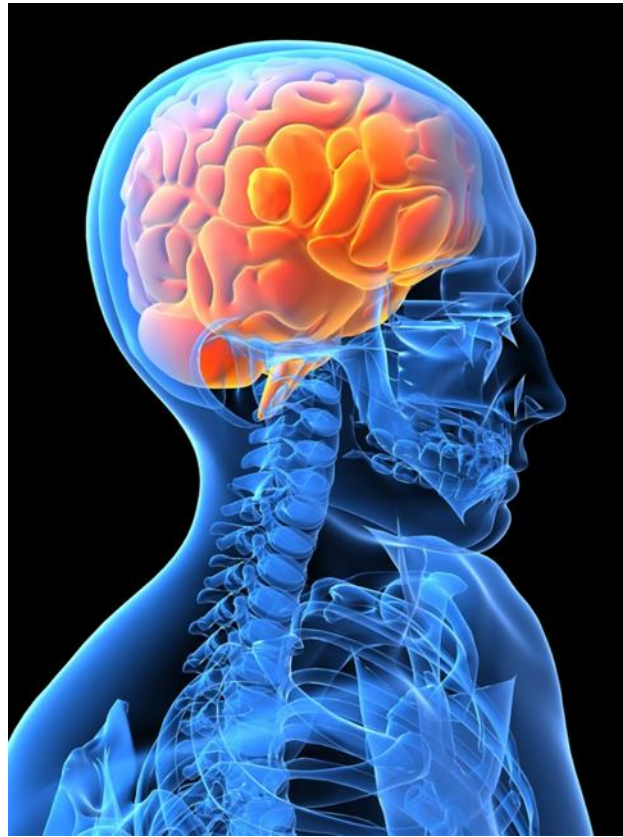*Providing and pursuing answers®*

www.abta.org

Brain Tumor Impact in the United States

- More than 79,000 new cases of primary brain tumors will be diagnosed this year
- More than 4,800 children between the ages of 0 – 19 will be diagnosed with a brain tumor this year
- Brain and central nervous system tumors are the most common cancers among children 0 – 14
- Almost 700,000 people in the U.S. are living with a primary brain or central nervous system tumor
- This year, nearly 17,000 people will lose their battle with a brain tumor
- More than 100 types of brain tumors exist

Information provided by the CBTRUS http://www.cbtrus.org/factsheet/factsheet.html

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Brain Tumors Defined

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What is a brain tumor?

- A collection of abnormal cells that grows in the brain or central spine canal
- One abnormal cell becomes two, two becomes four, four becomes eight, until there is a lump of abnormal cells

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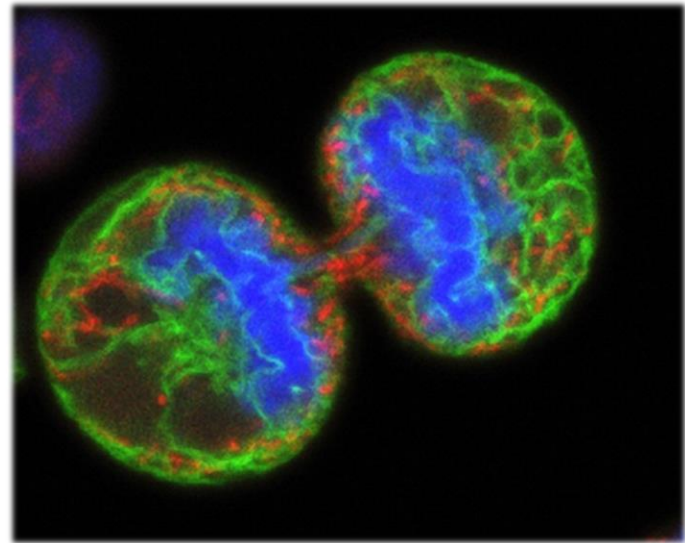
How do tumors form?

- Research is still trying to determine
    - Multiple insults to the cell?
    - One big hit?
    - Compromised immune system?
    - Cell-to-cell communications?

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Other terms

- Tumor
- Other terms
    - Neoplasm
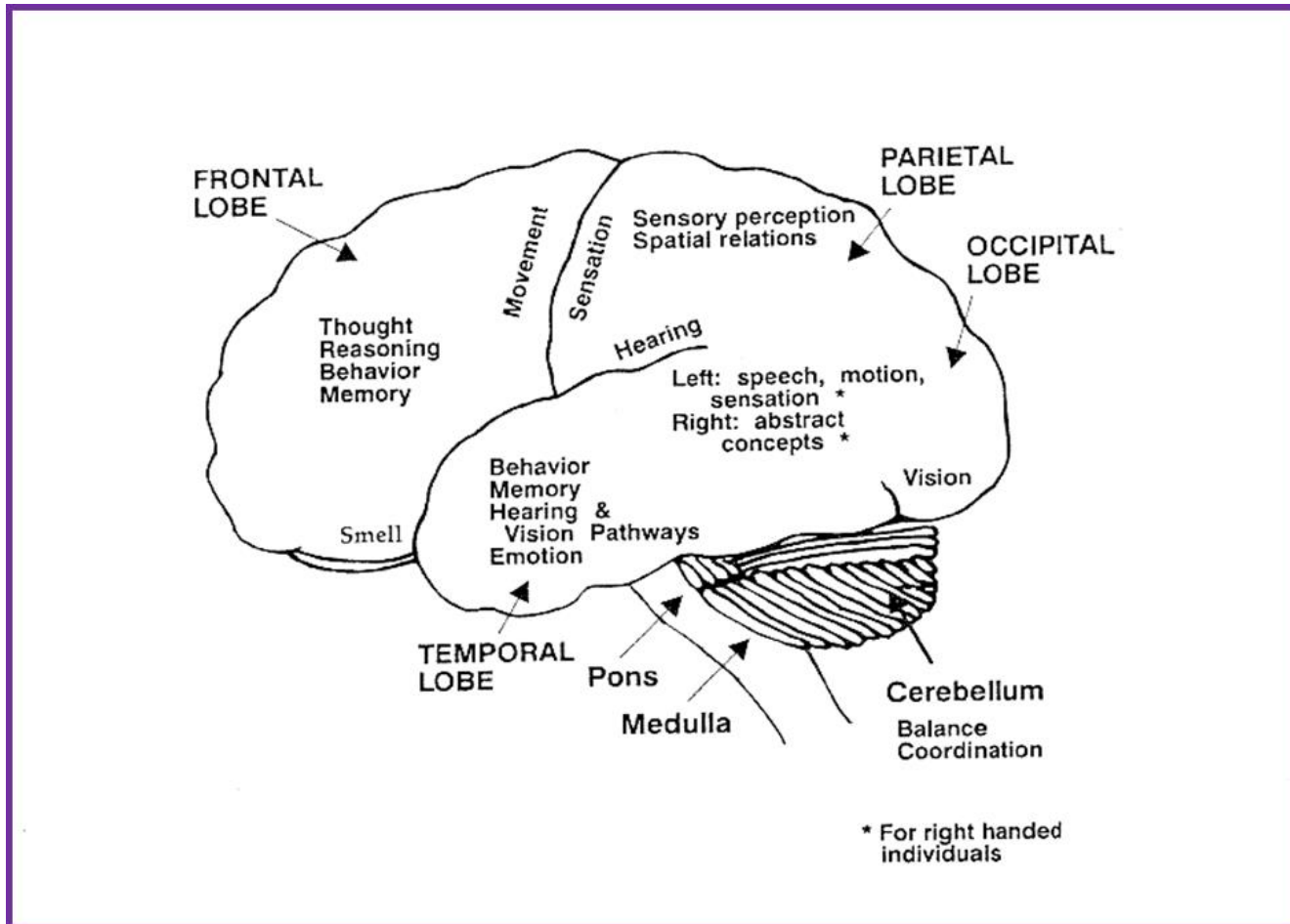   - Lesion
    - Space occupying mass

Common signs and symptoms of a brain tumor

- unusual headaches
- seizure(s)
- memory, personality, or behavior changes
- inability to process incoming information correctly
- visual changes: blurred vision, double vision
- change in motor control

Symptoms – correspond to tumor location and size & type of tumor

FRONTAL LOBE

Thought
Reasoning
Behavior
Memory

Smell

Movement

Sensation

Hearing

PARIETAL LOBE

Sensory perception
Spatial relations

OCCIPITAL LOBE

Left: speech, motion, sensation *
Right: abstract concepts *

Vision

Behavior
Memory
Hearing &
Vision Pathways
Emotion

TEMPORAL LOBE

Pons

Medulla

Cerebellum

Balance
Coordination

* For right handed individuals

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How brain tumors are diagnosed - MRI

- MRI scanning remains the gold standard
- CT scan for emergencies, then MRI

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Diagnosis continued…

- Surgery/tissue samples still most reliable method
- Biomarkers in tissue and bodily fluids are being used to confirm diagnosis

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Two broad categories of brain tumors

- **Primary Brain Tumors in U.S.**
  - begin in the brain, tend to stay in the brain
  - incidence = nearly 79,000 diagnosed annually
    - 4,800 are children
  - Prevalence = nearly 700,000 people
  - "benign versus malignant" and everything between
- **Metastatic Brain Tumors in the U.S.**
  - begin as a cancer elsewhere which spreads to the brain
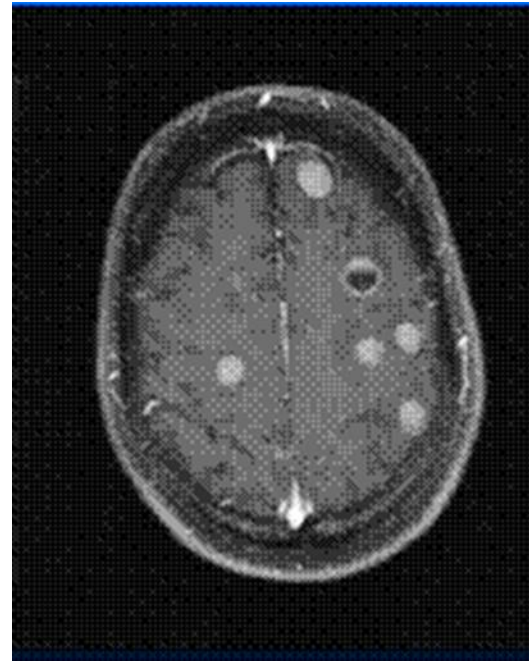 - always malignant

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Imaging - Primary and Metastatic

Primary

courtesy, Mayo Foundation

Metastatic

courtesy, Dr. Raymond Sawaya

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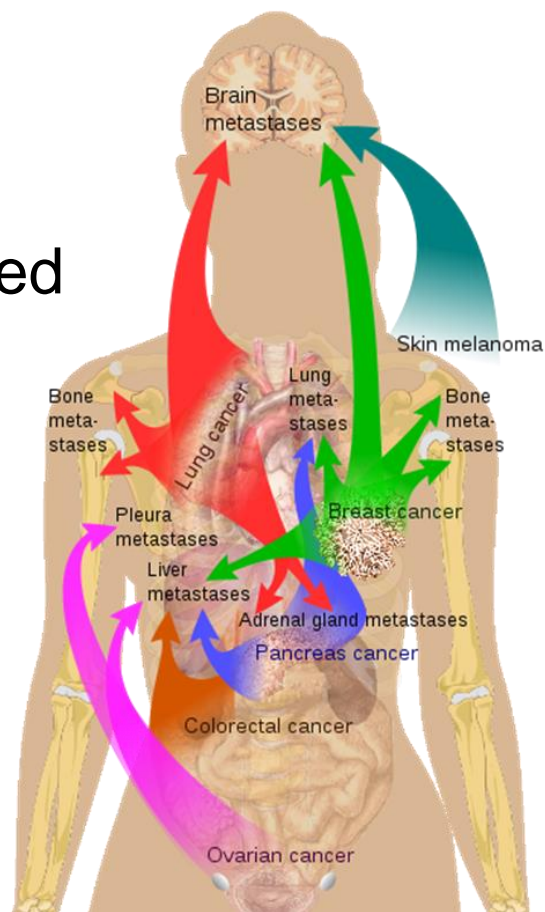
Metastatic brain tumors

- "Type" = the site of the primary cancer
- Single or multiple tumors
- Patients tend to receive treatment for metastatic brain tumor by oncologist who treated primary site, or a neuro-oncologist who specializes in brain tumors.

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Primary brain tumors

- Begin in the brain
- Over 100 types
- "Type" determined by cell type; classification changing to biologic differences
- The biology provides clues as to why some people do better than others
- Central Brain Tumor Registry of the United States (CBTRUS) tracks the incidence of brain tumors

Primary brain tumor

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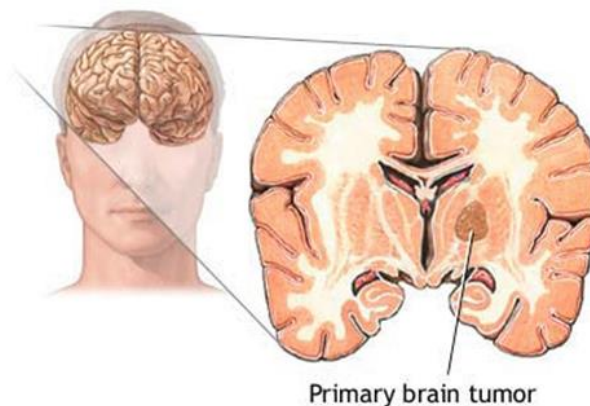
Is it cancer?

- Primary tumors:
  - Benign versus Malignant

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Tumor grading

- International grading system by WHO
- Graded I – IV
  - Grade I – least malignant, slow growth
  - Grade II – slow growing, but can spread, some recurrence
  - Grade III – faster growing, "malignant," often recurrence
  - Grade IV – fastest, most aggressive
- Tumor may contain several "grades" of cells at once

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Most common primary brain tumors

- Meningioma
- Gliomas
  - Low Grade Astrocytoma
  - Malignant Astrocytoma
  - Glioblastoma
  - Oligodendroglioma
- Medulloblastoma, Ependymoma, Pilocytic Astrocytoma (more common in children)
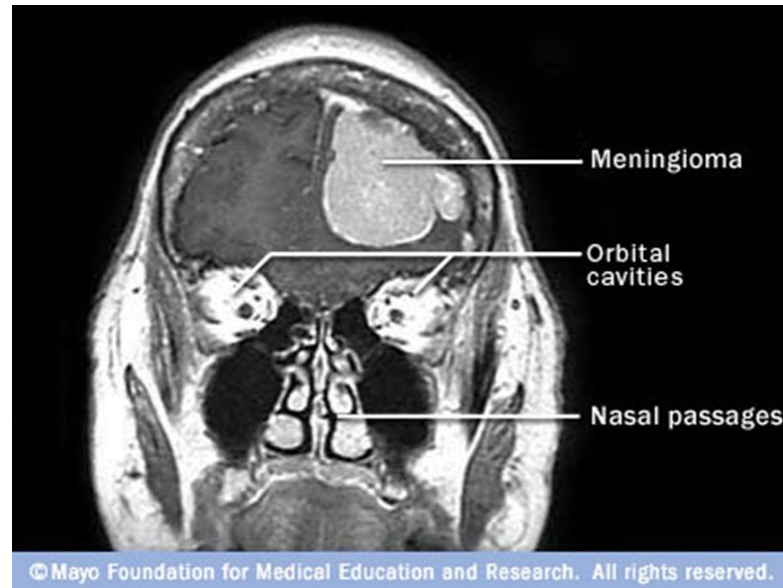
Meningioma

- Most common type of primary tumor
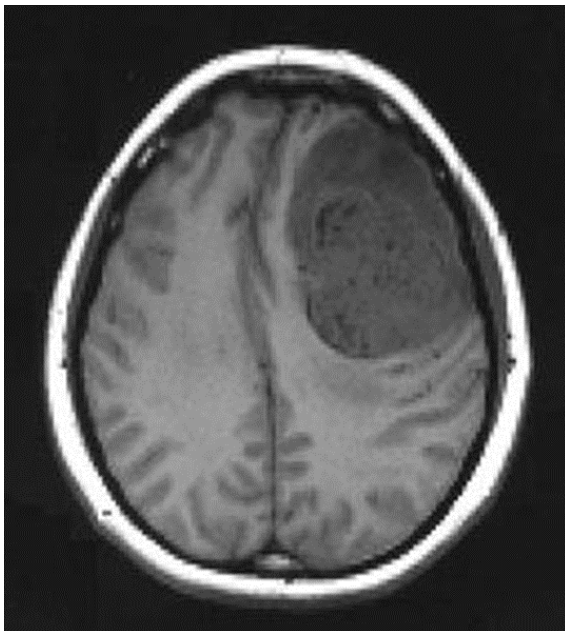 Arises from the meninges = the lining of the brain
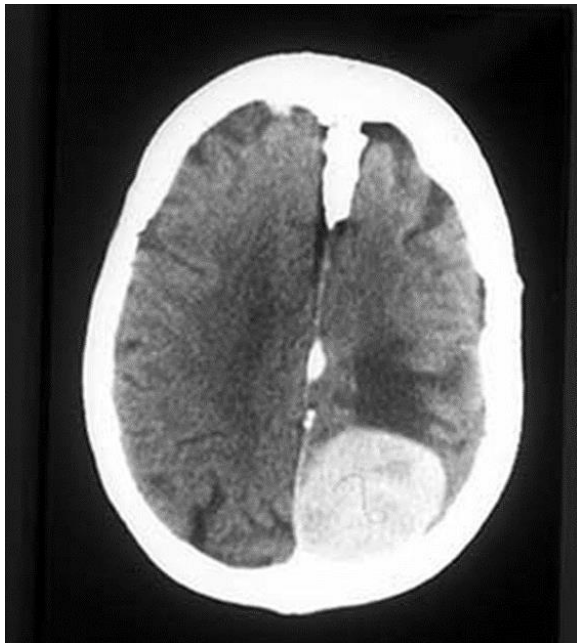
Google Images, www.student.bmj.com
(Left is right, right is left, bone is bright white)

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Malignant Glioma

- Gliomas arise from the glial, or "gluey," parts of the brain
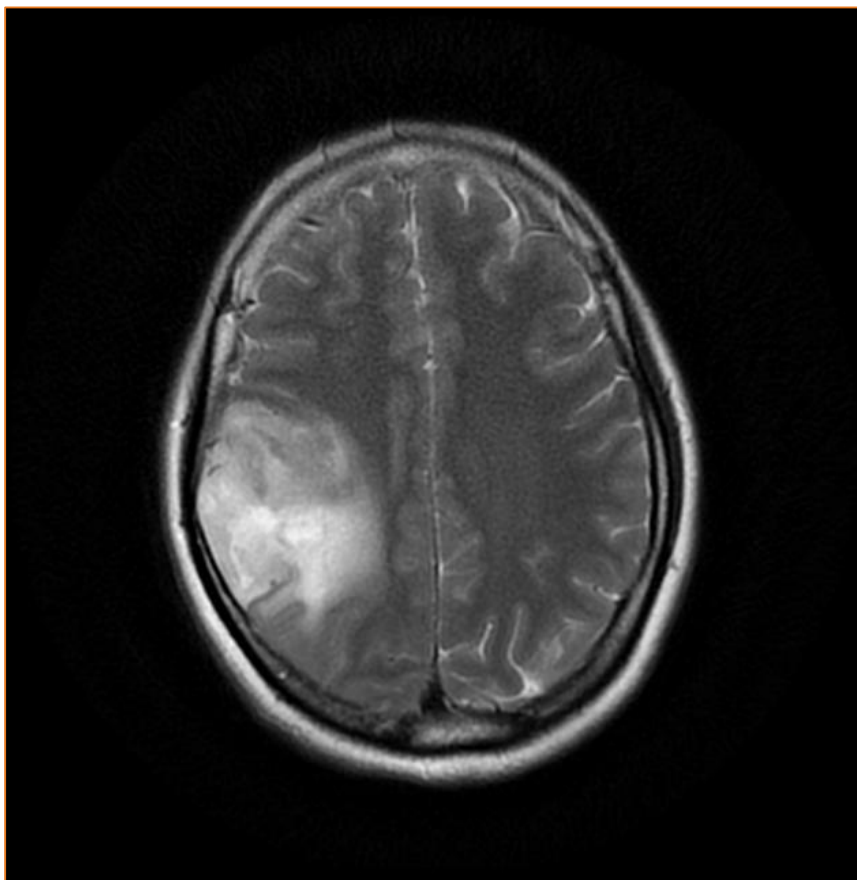- Different types of gliomas = astrocytomas, oligodendrogliomas, mixed gliomas

(Left is right, right is left, bone is bright white, malignant tumor with contrast dye is grey)
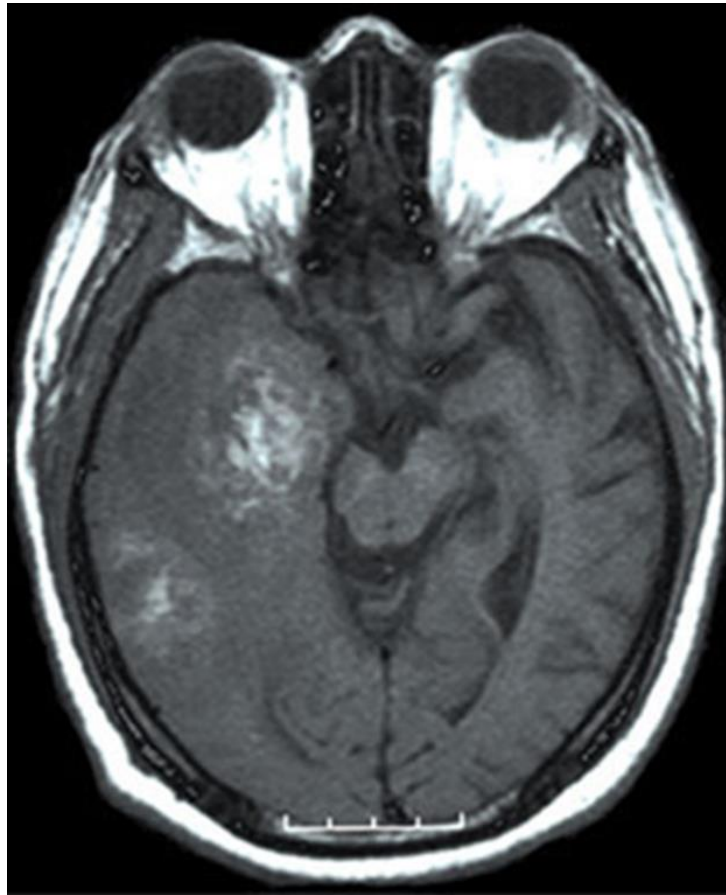*Midline shift, Google Images,*
http://www.ispub.com/xml/journals/ija/vol8n2/pregnant-fig1.jpg

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Anaplastic Astrocytoma

High grade tumor, pre-treatment
(Left is right, right is left)

http://radiopaedia.org/cases/anaplastic-astrocytoma-who-grade-iii

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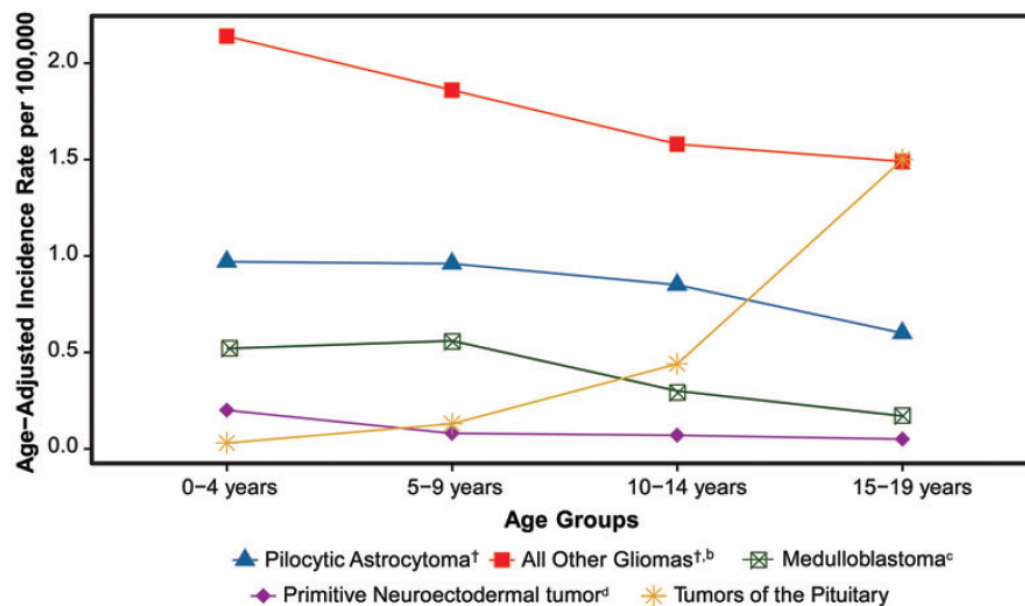Brain Tumor
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Glioblastoma

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Who is Most Affected by Brain Tumors?

- Brain tumors do not discriminate
- But, different tumor types at different ages
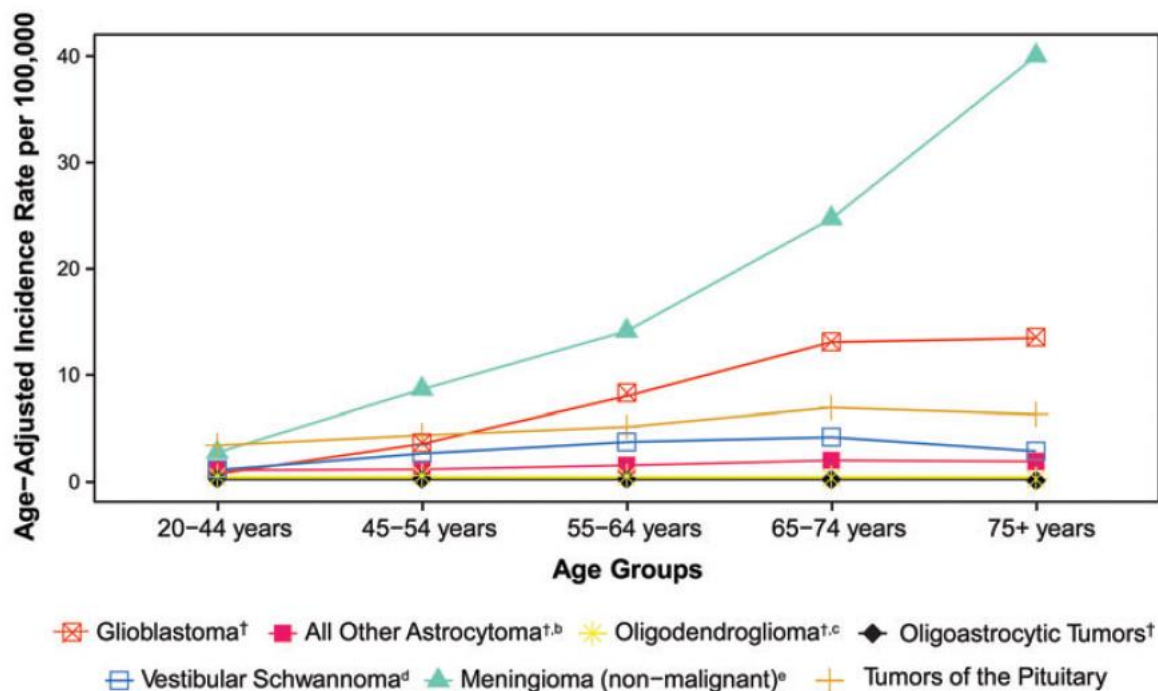
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Common tumors by age

Fig. 14. Age-Adjusted Incidence Rates[a] of Brain and CNS Tumors by Selected Histologies and Age Groups (Ages 20+), CBTRUS Statistical Report: NPCR and SEER, 2007–2011.

Common tumors by age continued…
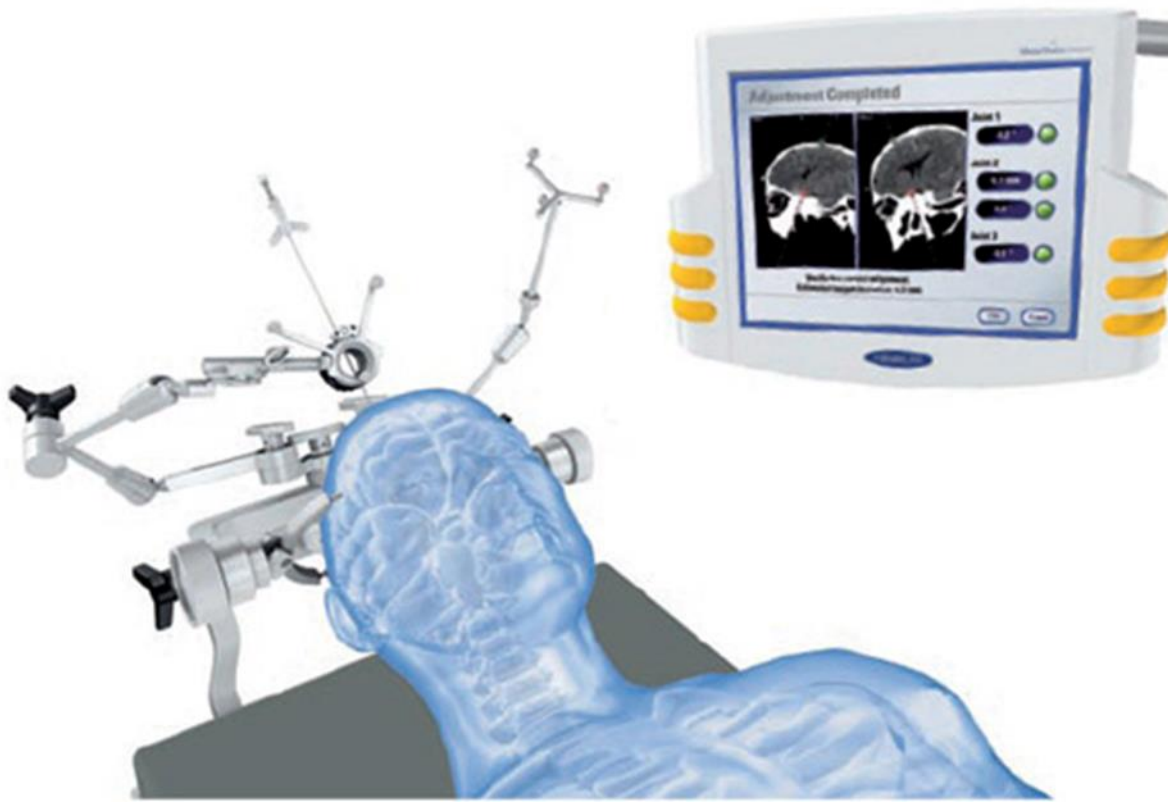
How are brain tumors treated?

- Surgery to remove tumor bulk
- Radiation to disable cell reproduction/shrink the tumor
- Chemotherapy to either kill tumor cells or interfere with their growth

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Where are new treatments headed?

Neuronavigation setup with VarioGuide™, courtesy BrainLab

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Where new treatments are headed cont.

- Enhanced tumor cell visibility/visualizing single cells live imaging and treatment during surgery
- Highly focused radiation, radiation enhancers
- Targeted drug therapies, "Repurposed" drugs
- Low intensity, intermediate frequency, alternating electric fields that disrupt cell growth
- Immune system enhancing drugs
- Combination diagnostics and therapeutics
- Biomarkers

Prognosis

- Definition: Prediction of how long someone may live with a tumor
- Benign tumors = greatest predictor of survival is extent of tumor removal/likelihood of recurrence, long term survival impacted by QOL
- Malignant tumors = greatest predictor is age (< 45), amount of tumor removed, type of tumor/biologic activity, functional status
- Why may one GBM be different than the next? general health/co-morbidities and location

Effects on patients with Malignant Tumors

- neurocognition –
  - slower processing
  - poor attention
  - short term memory
  - lack of abstract thinking ability
- changes in personality/judgment
- fatigue
- headaches
- left/right, up/down confusion
- visual changes/lack of depth perception

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Effects on patients with Benign Tumors

- "But you look fine to me"
- fatigue
- math, reading challenges
- short term memory issues
- employment/job related challenges
- balance, walking challenges
- personality/mood changes

Effects on the family

- change of traditional roles
- single parenting in a two parent household
- loss of relationships as they existed
- caregiving/caretaking/safety responsibilities
- fear of seizures
- fear of personality/behavior changes
- fear of the unknown
- fear of the future
- "care of the caregiver" takes second or third place

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Recap

- ❑ Tumors that begin in the brain are called _____ brain tumors.
- ❑ What is the annual incidence of brain tumors?
- ❑ Name two common types of brain tumors.
- ❑ What is the <u>most</u> common type of primary brain tumor?
- ❑ How are brain tumors diagnosed? Treated?
- ❑ What are some of the effects of a brain tumor?

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