What does the Brain Tumor Board do?

John S. Yu, M.D.
Professor and Vice Chair
Department of Neurosurgery
Director, Brain Tumor Center of Excellence
Director, Surgical Neuro-Oncology
Cedars Sinai Medical Center
A multidisciplinary group of health-care workers reviewing patient histories and data to make recommendations

Neurosurgeons
Neuro-radiologists
Neuro-pathologists
Neuro-oncologists
Radiation oncologists
Medical oncologists
Nurses
What tumors do we discuss?

Statistics

- Of all primary brain tumors:
  - 35% are Astrocytomas including Glioblastomas
  - 27% are Meningiomas
  - 8% are Nerve sheath tumors (acoustic neuromas, vestibular schwannomas, neurilemmomas)
  - 7% are Pituitary tumors
  - 3% are Lymphomas
  - 3% are Oligodendrogliomas
  - 2% are Medulloblastomas/embryonal/primitive

- Metastatic brain tumors are the most common brain tumor, with an annual incidence more than 4 x greater than that of primary brain tumors.
  - Cancers most commonly metastasize to the brain are lung and breast.
Clinical History of Brain Tumors

- **Symptoms** of brain tumors are usually associated with increased ICP
  - Headache
    - Generalized
    - Worse in the am
    - Aggravated by stooping, bending, and coughing
  - Vomiting
    - usually in the morning
    - with acute rise in ICP
Clinical Features of Brain Tumors

**Signs** of focal damage from tumor

**Disturbed Cerebral Function**

**Parietal Lobe**
- Disturbed sensation
- Visual field defect
  - lower quadrantanopia

**Occipital Lobe**
- Visual field defect
  - homonymous hemianopia

**Temporal Lobe**
- Receptive dysphasia
- Visual field defect
  - upper quadrantanopia

**Gerstmann’s syndrome** (Dominant hemisphere)
- Right/left confusion, finger agnosia, acalculia, agraphia

(Non dominant) Dress apraxia, geographic agnosia, Construction apraxia, anosognosia

**Frontal Lobe**
- Contralateral weakness
- Expressive dysphasia
- Personality changes
Astrocytomas - Imaging

- Low grade astrocytoma grade I/grade II
  - Hyperintense on T2
  - Hypointense on T1
  - Little, or no enhancement
    - Pilocytic astrocytomas –
      - Contrast enhancing often cystic with mural nodule
  - Little, if any edema
  - Little, or no mass effect
Astrocytomas - Imaging

- Anaplastic astrocytoma grade III/GBM grade IV
  - Complex enhancement on contrast imaging
  - Areas of hemorrhage
  - Mass effect
  - Irregular ring enhancement with hypointense center represents necrosis
- GBM
Pathological Classification of Brain Tumors

In 1979 the World Health Organization (WHO) drew up an internationally agreed classification of intracranial tumors based on the tissue of origin.

- 9 types of CNS tumors
  - Tumors of neuroepithelial tissue
  - Tumors of the meninges
  - Tumors of cranial and spinal nerves
  - Hematopoietic neoplasms
  - Germ cell tumors
  - Cysts and tumor-like lesions
  - Tumors of the sellar region
  - Local extensions from regional tumors
  - Metastatic tumors
Pathology of Brain Tumors

- Primary brain tumors can be classified as either:
  - **Benign**
    - Very slow growing cells
    - Distinct borders, rarely spreads
    - Well differentiated (cells appear almost normal)
Pathology of Brain Tumors

- **Malignant**
  - Rapid growth
  - Poor differentiation
  - Increased cellularity, mitosis, necrosis and vascular proliferation
  - However, metastases to extracranial sites rarely occur.
Possible Causes of Brain Tumors and Risk Factors - Genetic Factors

- Genetic Factors
  - Transformation of normal cells to malignant growth probably results from a variety of different processes:
    - Normal cell growth and differentiation controlled by Proto-oncogenes
      - Expression is altered resulting in oncogenes
        - Alters encoded proteins transforming cell into malignant state
    - Inactivation of expression of tumor suppressor genes
    - Over expression of genes controlling growth factor.
Mutations leading to infiltrative astrocytic tumors.

- Molecular studies have identified some of the genetic changes that underlie the pathologic differences among astrocytic tumors; progression in tumor grade is associated with an ordered accumulation of mutations.
Astrocytoma - Treatment

- Depends on a number of factors:
  - Site of lesion
  - Degree of malignancy
  - +/- Elevated ICP
  - Degree of disability and effect of steroid therapy
  - Suspected nature of tumor on imaging
  - Patient’s age
  - Patient’s wishes
Common Brain Tumors – *Astrocytoma* - Treatment

- **Grade I and Grade II**
  - **Surgery**
    - Complete surgical resection if possible
    - Biopsy or partial resection is recommended in almost all cases to determine pathology
  - **Radiation Therapy**
    - Fractionated XRT to residual tumor postop
  - **Chemotherapy**
    - Only with tumor progression
    - PCV (procarbazine, CCNU, vincristine) to stabilize growth.
Common Brain Tumors – *Astrocytoma - Treatment*

- **Grade III and Grade IV**
  - Standard against which other treatments are compared:
    - **Surgical Resection**
    - Followed by external beam radiation (EBRT)
      - 40 Gy whole brain + 15-20 Gy to tumor bed = 60 Gy
    - Median survival of 17 weeks after BX + XRT, versus 30 weeks for SX and XRT.
Common Brain Tumors – *Astrocytoma* - Treatment

- **Chemotherapy**
  - **Alkylating agents** benefit ~ 10% of patients
    - Carmustine (BCNU)
    - Cisplatinum (Cisplatin)
    - **Temozolomide** (Temozolomide)
      - FDA approved for treatment of initial relapse of AA and progression
      - Used (off label) for newly dx’d GBM and AA
Treatment of Brain Tumors

- **Treatment of Edema**
  - Dexamethasone
  - Mannitol

- **Seizure Prophylaxis**
  - Dilantin
  - Valproic Acid
  - Tegretol
  - Keppra

- **Neurosurgery**
  - Surgical Resection
  - Biopsy
  - CSF access procedures

- **Radiation therapy**
  - SRT
  - SRS

- **Chemotherapy**
  - Oral
    - Alkylating agents
  - Intracranial wafers

- **Clinical Trials**
  - Immunotherapy
Treatment of Brain Tumors

Immunotherapy

- Immunotherapy
  - T-cell mediated antitumor immunity
  - Pt’s with gliomas demonstrate impaired immune function.
  - Glioma cells down regulate surface expression of MHC molecules, depriving infiltrating immune cells of signals needed to recognize and clear tumor cells.
  - Dendritic cells (antigen presenting cells) are pulsed with tumor protein to make a vaccine.
  - DC introduces tumor associated antigen (TAA) to T-cells.
  - Activated T-cells eliminate tumor cells.
Brain Tumor Board

Questions?