MR of Adult Intra-Axial Tumors

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November 17, 2014

Disclosures
• None

Adult Intra-axial Tumors: a List
• Metastases
• Neuroepithelial tumors
  – Astrocytic
    • Low Grade Astro
    • Anaplastic Astro
    • Glioblastoma
  – Oligodendrogial
• Hematopoietic
  – Lymphoma
• Vascular/ Stromal
  – Hemangioblastoma

Adult Intra-axial Tumors

Guess WHO?

Brain Tumors: Identifying

Does your tumor have a high mitotic rate?

Guess WHO?

Does your tumor have a high mitotic rate?
Adult Brain Tumors: Identifying

• Imaging
  – Multiplicity
  – Size
  – CT Density
  – MR Signal intensity
    • T1, T2, FLAIR, DWI, GRE/SWI
  – Enhancement/perfusion
  – MR Spectroscopy characteristics

Intra-Axial Tumors: Metastases

• 48 yo female, nausea, vomiting, speech difficulty.

Intra-Axial Tumors: Metastases

• Cancers that commonly metastasize to brain
  – Lung cancer
  – Breast cancer
  – Kidney cancer
  – Melanoma
  – Certain sarcomas
  – Germ cell tumors
  – Bladder cancer

Intra-Axial Tumors: Metastases

• 46-year-old female with history of melanoma
Intra-Axial Tumors: Metastases

- Metastatic Breast Carcinoma

Brain Tumors: Astrocytomas

- Adult Main Types
  1. Glioblastoma (Multiforme) (WHO IV)
  2. Anaplastic Astrocytoma (WHO III)
  3. Low Grade Astrocytoma (WHO II)

Glioblastoma

- 43-year-old male initially presenting with headache.
Glioblastoma

WHO IV

Astrocytomas: GBM

• Imaging
  - Usually LARGE
  - Rind of enhancement, core of necrosis
  - Surrounding nonenhancing tumor component
  - Hemorrhagic components (GRE/SWI)
  - "Butterfly Glioma"
  - Multifocality (less common)

• 68-year-old male with facial droop.

Astrocytomas: GBM

• 68-year-old male with facial droop.

T1  FLAIR  GRE

Astrocytomas: GBM

• 68-year-old male with facial droop.

T1  FLAIR  GRE

Astrocytomas: GBM

• 68-year-old male with facial droop.

DWI  ADC
Astrocytomas: GBM

Prognosis: Mean survival <1 year

Adult Intra-Axial Tumors: Neuroepithelial tumors: Astrocytomas:

ANAPLASTIC ASTROCYTOMA
Anaplastic Astrocytoma

WHO III

Imaging
- Location: cerebral hemispheres, thalami
- Vary in size
- Infiltrating, expansile
- None to moderate enhancement, variety of patterns. Presence predicts recurrence
- Calcs/hemorrhage uncommon

51-year-old male with headaches, subsequent diplopia, bilateral facial numbness, incoordination.

T2
T1 +C

63-year-old male with constant headaches

FLAIR
T1 +C
ADC

Normal
Lesion

Short Echo
Short Echo
Long Echo
Anaplastic Astrocytoma

Mean survival 2-3 years
24% 5-year
15% 10-year survival

Low-Grade Astrocytoma

WHO II

Low-Grade Astrocytoma

- Imaging
  - 2/3 Supratentorial
  - Cortical involvement common
  - Often not well-defined
  - Can calcify
  - No enhancement
  - Mass effect
  - May become large if in frontal lobes

Adult Intra-Axial Tumors: Neuroepithelial tumors: Astrocytomas:

LOW GRADE ASTROCYTOMA
Low Grade Astrocytoma

- 30-year-old female with severe headache, history of breast cancer.

Low Grade Astrocytoma

- 26-year-old female post fall with confusion.

Low-Grade Astrocytoma

- Advanced Imaging
  - DWI: No reduced diffusivity
  - MRS: ↑ Choline, ↓ NAA, no Lactate
  - Perfusion: low rCBV

Mean survival: 6-10 years

Brain Tumors: Astrocytomas

- Summary Characteristics
  - Location: supratentorial/cerebral
  - Pattern: Infiltrating, Often involves both gray and white matter
  - T2-hyperintense

Brain Tumors: Astrocytomas

- Telling them apart
  - Higher grade tumor indicators
    - More enhancement
    - Crossing corpus callosum
    - Larger
    - Necrosis
Unknown Case

- 30-year-old male with seizures.

Oligodendroglioma

\textbf{WHO II}

50\% are WHO II
50\% are WHO III

Note: I do not have an oligodendroglioma.
Oligodendroglioma

- Imaging
  - Round/oval
  - Sharply demarcated
  - Cortical/subcortical
  - Little to no edema
  - Variable enhancement
  - Coarse calcification in 70-90%

- MR
  - Heterogeneous, T2/FLAIR hyperintense
  - Little to no vasogenic edema
  - Variable Enhancement

- Advanced Imaging
  - DWI: No reduced diffusivity
  - MRS: ↑ Choline, ↓ NAA, no lactate peak
  - Perfusion: misleading

Incidentally:

Chicken-wire Michael Jackson

FLAIR  CBV

Functional MRI (fMRI)
Word Generation
Oligodendroglioma

• 55-year-old male with altered mental status, speech difficulties.

Oligodendroglioma

• 43-year-old with seizure.

Oligodendroglioma

• 59-year-old male with confusion.

Median survival: 10 years. Fatal in most cases. Local recurrence common.

Unknown Case

• 59-year-old male with confusion.
Brain Tumors: Lymphoma

**LYMPHOMA**

5-year survival <10%
Younger = Better
Worse in HIV/AIDS

- 85% in cerebral hemispheres
- 95% contact a CSF surface
- Highly variable size
- Predilection for the corpus callosum, BG, Thalami
- 40-60% multiple
- Half of multiple are bilateral
- Sometimes much edema
Primary CNS Lymphoma

- 29 year-old, previously healthy.

Diffuse Large B-Cell Lymphoma

- 34-year-old male with HIV/AIDS, confusion.

Diffuse Large B-Cell Lymphoma

- Demographics
  - 2nd most common posterior fossa tumor in adults
  - 25-40% associated with von Hippel-Lindau Syndrome
  - Ages
    - 30-65 yrs
    - Younger in vHL

Hemangioblastoma

Adult Intra-Axial Tumors: Vascular/Stromal Neoplasm:

HEMANGIOBLASTOMA
Hemangioblastoma

Headache
~Cerebellar symptoms

- Imaging
  - 90-95% in posterior fossa
  - Classically cyst with nodule
  - or Solid
  - Nodule abuts pia
  - Nodule (not cyst) enhancement
  - Multiple is diagnostic for vHL

Hemangioblastoma

Stable, then progressive
Complete resection is curative
(unless vHL)

In Summary

- Most common adult intra-axial tumors
  - Metastases (~50%)
  - Neuroepithelial tumors
    - Astrocytic
    - Oligodendroglial
  - Hematopoietic
    - Lymphoma
  - Vascular/Stromal
    - Hemangioblastoma
Thank you!

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