CNS Tumors and Sudden Death

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Disclosure

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Objectives

• Learn some of the common symptoms of an occult brain tumor.
• Understand how brain tumors cause sudden death, both directly and indirectly.
• List most common primary and secondary brain tumors resulting in sudden death.
Normal brain –
external and cut surface
After formalin fixation of brain, thin piece of tissue taken from selected area. Tissue placed in plastic cassette, followed by dehydration process, embedding in paraffin wax. Ultra-thin slice cut on microtome, placed on surface of glass slide.
Thin slice of tissue on glass slide stained with dyes (H&E)
Presentation

• Symptoms of a slowly growing brain tumor include:
  
  Vision changes.
  Headaches, dizziness.
  Personality change.
  Fatigue.
  Seizures, particularly with meningeal involvement.
Mechanism of death

• How do brain tumors cause sudden death?

• Brain has a limited capacity to compensate for slow growth of a brain tumor by shifting of structures into opposite compartments and compression of the adjacent ventricular system.
Mass Effect

- The rigid skull limits the brain’s capacity to expand in response to growing tumor volume.
- Eventually, the brain’s compensatory mechanisms are overwhelmed, herniation and compression of vital structures in the brain stem develops, with unconsciousness, cardio-respiratory arrest.
- However, a sudden increase in volume of the tumor due to edema in/around the tumor or intra-tumoral hemorrhage does not allow time for these compensatory mechanisms to occur, with rapid obtundation and death.

Seizure

- This can occur particularly when the tumor impinges on the meninges or is primarily meningeal in origin.
Primary Brain Tumors

• Sudden death from undiagnosed primary brain tumor is rare (0.04-0.24% frequency in several autopsy case series).

• Primary brain tumors causing sudden death:
  - Astrocytoma/Glioblastoma – nearly 50%
  - Oligodendroglioma
  - Occasional cases – meningioma, medulloblastoma, teratoma, pituitary adenoma.
• Some primary tumors are particularly prone to develop hemorrhage:
• Most common – oligodendroglioma
• Teratomas, pituitary apoplexy
Indirect cause of death

• Some brain tumors can cause death indirectly due to symptoms resulting in a secondary fatal injury.

• Tumor effects such as ataxia, confusion, seizures can precipitate a fall, motor vehicle accident, or even drowning while swimming or bathing.
Secondary Brain Tumors

• May be undiagnosed or recurrent.

• Up to a quarter of patients with cancer will have brain metastases at autopsy.

• Highest incidence is in 50-70 year old group.
• Tumor embolization to CNS – tumor deposits typically lodge at watershed areas and grey-white matter interface in cerebrum. Metastases to brain stem and spinal cord are rare.

• Generally form spherical masses in brain with marked surrounding edema.
• Tumors most likely to metastasize to CNS:

• Lung, breast, skin (melanoma), kidney (in descending order of frequency).

• Hemorrhage within tumor deposits is most frequent with malignant melanoma, choriocarcinoma, renal cell carcinoma.
Summary

• Sudden death from undiagnosed primary brain tumors is rare – less than 1%.
• Most common primary brain tumor causing sudden death is an astrocytoma, particularly glioblastoma.
• Brain tumors can cause sudden death indirectly, due to their effects.
• Up to ¼ of patients with non-CNS malignancies will have brain metastases at autopsy.
• Primary tumors most likely to metastasize to the CNS originate from lung, breast, skin and kidney.
Post-test

• General symptoms of a brain tumor include each of the following, except:
  a. headaches
  b. seizures
  c. lower abdominal pain
  d. vision changes
• The most common primary brain tumor causing sudden death is:
  a. astrocytoma/glioblastoma
  b. teratoma
  c. medulloblastoma
• A tumor from which site is most likely to metastasize to the CNS:
  a. bone
  b. lung
  c. colon
  d. ovary