

Central Nervous System Tumors - Brain Tumors

Clinical Background

Central nervous system (CNS) tumors cause either focal or generalized neurologic symptoms.

Epidemiology

- Incidence – 20,500 new cases of primary brain tumors are diagnosed yearly in the U.S. (American Cancer Society, 2007)
 - Half are histologically benign
- Sex – M<F (minimal)
 - Higher meningioma incidence in females

Risk Factors

- High-dose ionizing radiation (gliomas)
- Familial
 - Neurofibromatosis 1 (NF-1) (neurofibroma, glioma, sarcoma)
 - Neurofibromatosis 2 (NF-2a) (schwannoma, glioma, meningioma)
 - Tuberous sclerosis (astrocytoma)
 - Von Hippel-Lindau disease (hemangioblastoma)
 - Turcot syndrome
 - Li Fraumeni syndrome (glioma, astrocytomas, choroid plexus tumors)
 - Retinoblastoma
 - Multiple endocrine neoplasia 1 (pituitary adenoma, schwannoma, glioma)
- Virus infection
 - HIV infection is associated with an increased risk of CNS lymphoma

Pathophysiology

- Histologically classified as glioma or non-glioma
 - Gliomas (about 50% of primary brain tumors)
 - Astrocytomas (includes glioblastoma multiforme [GBM])
 - GBM – 50% of gliomas
 - Oligodendrogliomas
 - Mixed gliomas
 - Ependymomas
 - Non-gliomas
 - Meningiomas – usually benign
 - Pituitary adenomas – often benign
 - Primary CNS lymphoma
 - Medulloblastoma – childhood cerebellar tumor
 - Brain metastases – lung, breast and melanoma are most common
- Malignant gliomas are the most common type of primary brain tumor
- Differentiation of astrocytomas from oligodendrogliomas has prognostic and therapeutic importance

Clinical Presentation

- Headache, nausea, vomiting, hemiparesis, aphasia, memory loss, language deficit, visual deficit
- Seizures – more common with gliomas

Diagnosis

- Indications for testing
 - New onset of headaches associated with focal neurologic deficits in patient without previous headaches
 - Change in character of headaches in patient with previous headaches
 - New onset of seizures
- Laboratory testing
 - CBC, chemistry profile, erythrocyte sedimentation rate (ESR)
 - Very few abnormalities except for possible increased ESR
 - Not used in diagnosis
- Histology
 - Immunohistochemistry – Ki67, GFAP, vimentin, S100 for glial tumor diagnosis
- Imaging studies
 - CT, MRI
 - MRI is more sensitive than CT for diagnosis and in identifying tumor type
 - PET is used in assessing diagnosis, grading gliomas and differentiating between tumor recurrence and radiation necrosis

Prognosis

- FISH
 - Combined loss of short arm of chromosome 1 (1p) and long arm of chromosomes 19 (19q) is a prognostic marker of oligodendrogliomas
 - Patients with both 1p and 19q deletions have a better prognosis than those with a single deletion or none
 - Loss of 1p may identify treatment-sensitive malignant gliomas, in particular subtypes of anaplastic oligodendroglioma
- Immunohistochemistry
 - Glial tumors – Ki67
 - Oligoblastomas – *PTEN* mutation

Differential Diagnosis

- Meningitis, encephalitis
- Seizure disorders
- Migraine headache
- Stroke

Lab Tests

Indications for Laboratory Testing

Tests generally appear in the order most useful for common clinical situations. For test-specific information, refer to the test number in the ARUP Laboratory Test Directory on the ARUP Web site at www.aruplab.com.

Test Name and Number	Recommended Use	Limitations	Follow Up
Immunohistochemistry Stain Offering arup005 Method: Immunohistochemistry	For fixed tissue samples, consultative services as well as immunohistochemical staining for Ki67, GFAP, vimentin, S100		
1p/19q, d(1;19) Deletion by FISH 0049360 Method: Fluorescence in situ Hybridization	Prognosis of oligodendrogliomas Fix in formalin for optimal results	Absence of combined loss of 1p and 19q does not exclude diagnosis of oligodendroglioma	

Guidelines

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