

# ***Understanding Brain Tumors***

***2.0 Contact Hours***

***Presented by:***

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# Understanding Brain Tumors

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## Objectives

After completing this course, the student will be able to:

- Identify possible symptoms of a brain tumor
- Review the different areas of the brain and their functions
- Discuss different types of brain tumors
- Discuss different types of treatment
- Review symptoms from the treatment of brain tumors

A brain tumor is defined as any abnormal or uncontrolled growth of cells in the brain. Tumors can be either benign (non-cancerous) or malignant (cancerous). Because they are located in the brain, even a benign tumor can be dangerous. The brain is surrounded by the skull, which means as the tumor grows it starts to press upon normal brain tissues which can cause inflammation and brain swelling. That's why it is important that both types be evaluated for treatment as soon as possible.

When a tumor originates in the brain itself, it is called a primary brain tumor. Sometimes cancer can spread to the brain from other areas, such as the lungs or the breasts. Then is called a secondary (or metastatic) brain tumor. Compared to other cancers, brain tumors are relatively uncommon, but they are considered to be dangerous because of the location and sometimes their aggressive nature.

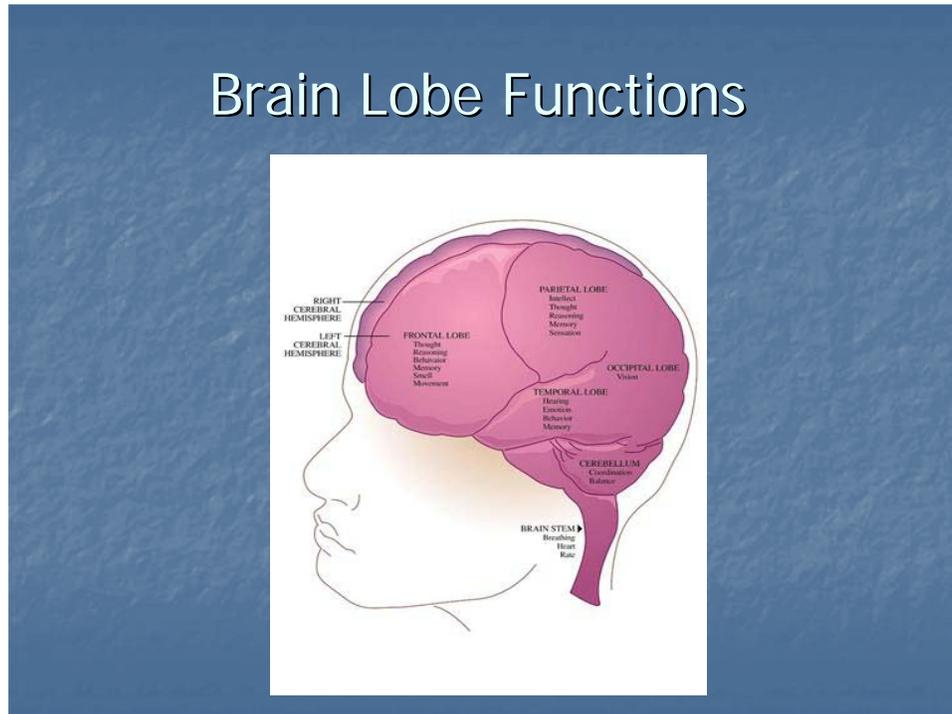
## Possible Symptoms of Brain Tumors

- Headache, especially
  - Recent onset of new type
  - Persistent
  - Worse on awakening
- Vomiting, especially if more severe in the morning
- Personality changes or behavior changes
- Intellectual decline, including
  - Loss of memory
  - Impaired calculating abilities
  - Impaired judgment
- Seizures, new onset

- Neurological changes, including
  - Vision problems (e.g., double vision, decreased vision)
  - Hearing loss
  - Decreased sensation or weakness of a body area
  - Speech difficulties
  - Decreased coordination
- Weakness, lethargy, decreased alertness
- Tongue problems, difficulty swallowing, hiccups
- Impaired sense of smell
- Uncontrollable or dysfunctional movement, hand tremor
- Cessation of menstruation prior to menopause age
- Facial paralysis
- Eye abnormalities, including
  - Different sized pupils
  - Uncontrollable movement
  - Drooping eyelid
- Confusion, unusual or strange behavior
- Temporary halt in breathing

## Understanding the Brain

Different areas of the brain control different functions. The symptoms of a brain tumor can vary depending on the area of the brain that is affected.



### Left Temporal Lobe

Hearing, vision, smell, understanding, and memory of what is seen or heard, recognizing words, personality, behavior and sexual behavior.

### Brain Stem

Breathing, heart rate, digestion, level of alertness, sleep, sweating, blood pressure, temperature, and balance.

### Cerebellum

Balance, posture, and motor coordination including extremities, and some memory for reflex movements.

### Right Temporal Lobe

Hearing, smell, understanding, organizing, and concentrating on what is seen or heard; recognition of musical tones, music sounds, and non-speech information (e.g., drawings). Long term memory, personality, and behavior, including sexual behavior.

### Occipital Lobe

Accurately interpreting what is seen and visual images. Reading and writing, finding objects, identifying colors, recognizing words and drawn objects, and recognizing whether an object is moving.

### Parietal Lobe

Vision and sense of touch. Coordinating input from different senses for understanding, sensory control of the body, writing, mathematics, and language. Body positioning, handling of objects, and verbal and non-verbal memory.

### Frontal Lobe

Higher intellectual functions, such as consciousness and responses to outside stimuli; personality. Motor coordination for swallowing, salivation, vocalization, chewing, facial expressions; as well as for hands, arms, torso, pelvis, legs, and feet.

## Common Types and Characteristics of Brain Tumors

There are two types of cells that make up the nervous system: neurons and neuroglia. Neurons send and receive nerve messages. Neuroglia, otherwise known as glial cells, often surround the neurons. Glial cells play a supportive role by nourishing, protecting and supporting neurons. There are six kinds of glial cells; oligodendrocytes, astrocytes, ependymal cells, Schwann cells, microglia, and satellite cells.

A brain tumor that develops from glial cells is called a glioma. About half of all brain tumors and one-fifth of all primary spinal cord tumors form from glial cells. Gliomas tend to grow in the cerebral hemispheres, but may also occur in the brain stem, optic nerves, spinal cord, and cerebellum.

Gliomas are divided into subgroups depending on the origin of the glial cells. The most common type of glioma is an astrocytoma.

### Astrocytoma

An astrocytoma develops from star-shaped glial cells (astrocytes) that support nerve cells. It accounts for about 17% of all primary tumors. It can occur anywhere in the central nervous system (CNS), but the most common

location is in the frontal lobe. A biopsy of the tissue is required to accurately assign a grade to the tumor. Astrocytomas are generally classified as low or high grade. Low grade astrocytomas (grades I or II) are slow growing. High-grade astrocytomas (grades III and IV) grow more quickly. The WHO classification divides astrocytomas into four grades:

- Grade I      Pilocytic Astrocytoma
- Grade II     Low-grade Astrocytoma
- Grade III    Anaplastic Astrocytoma
- Grade IV     Glioblastoma Multiforme (or GBM)

Treatment for the astrocytoma depends on the grade and the location. The higher the grade, the more dangerous location, the more invasive and aggressive the treatment. Treatment ranges from wait and watch to surgery, chemo, and radiation therapy.

### **Ependymoma**

Ependymoma tumors begin in the ependymoma, cells that line the passageways in the brain where cerebral spinal fluid (CSF) is produced and stored. Ependymomas are classified as either supratentorial (in the cerebral hemispheres) or infratentorial (in the back of the brain). This tumor can be slow growing or fast growing. It accounts for two percent of all brain tumors.

Treatment for this tumor is determined by whether it has spread to the spinal cord, but typically includes surgery followed by radiation therapy.

### **Oligodendroglioma**

This tumor type develops from glial cells called oligodendrocytes. It occurs frequently in the frontal or temporal lobes. This tumor can be classified as low grade or high grade and accounts for less than three percent of all brain tumors.

Treatment for this tumor depends on the grade. The watch and wait with serial MRIs option may be recommended. If the tumor is a malignant form called an anaplastic oligodendroglioma, the common treatment option is surgery, then chemo and radiation therapy.

### **Non-Glial Tumors**

The following tumor types develop on or in structures within the brain, such as nerves, blood vessels, and glands.

- Acoustic Neuroma (Schwannoma)
  - Also known as a vestibular schwannoma
  - Grows on the sheath surrounding the eight cranial nerve in the inner ear
  - More common in women than men

- Surgery or radiation therapy (radiosurgery) may be treatment options
- Chordoma
  - A rare and low grade tumor
  - Occurs at the sacrum
  - Originates from cells left over from early fetal development
  - Surgery and radiation therapy are common forms of treatment
- CNS Lymphoma
  - Develops in the lymphatic system
  - Staging is critical to determine treatment options
  - Radiation therapy, chemotherapy, and corticosteroids are the most common forms of treatment
- Craniopharyngioma
  - Most common in the parasellar region of the brain
  - Tends to low grade
  - Often accompanied by a cyst
  - Originates in cells left over from early fetal development
  - Surgery is the standard treatment
  - Radiation therapy may be used
- Hemangioblastoma
  - Commonly located in the cerebellum
  - Originates from the blood vessels
  - Can be large in size
  - Often includes a cyst
  - Surgery is the standard treatment
  - Radiosurgery may be given to destroy multiple inoperable lesions
- Medulloblastoma
  - A type of primitive neuroectodermal tumor (PNET)
  - Often located in the cerebellum or near the brain stem
  - May obstruct the fourth ventricle, causing hydrocephalus
  - Can spread to the spinal cord through CSF
  - Surgery is the standard treatment
  - Radiation therapy of the brain and spine is often recommended
  - Chemotherapy is usually part of the treatment plan
- Meningioma
  - These tumors grow from the meninges
  - They are graded from high to low
    - Grade I, Benign Meningioma
    - Grade II, Atypical Meningioma
    - Grade III, Malignant (Anaplastic) Meningioma
  - The lower the grade, the lower the risk of recurrence and aggressive growth
  - May arise from previous treatment from radiation
  - Accounts for 27 percent of all primary brain tumors

- In rare cases, multiple Meningioma can develop at the same time
- If there are no symptoms, watch and wait with serial MRIs is often the recommended treatment
- Surgery, radiation and chemo may be recommended with high grade meningiomas
- Follow up MRIs are needed indefinitely, because meningiomas can recur years or even decades after treatment
- Pineal Tumor
  - A malignant form is called pineoblastoma
  - Named for its location in or around the pineal gland
  - Can range from low grade to high grade
  - Occurs most often in children and young adults
  - Surgery and radiation therapy is often recommended treatment
- Pituitary Tumor
  - Some secrete abnormally high amounts of hormones, causing acromegally
  - Can range from high grade to low grade
  - Accounts for six percent of all brain tumors
  - If the tumor is large, surgery is recommended treatment
  - Radiation therapy may also be used
- Primitive Neuroectodermal Tumors (PNET)
  - There are several tumor types in this category depending on location
    - Pineoblastoma
    - Medulloblastoma
    - PNET
  - Very aggressive and tend to spread throughout the CNS
  - Grow from undeveloped brain cells
  - Tend to be large
  - Occur most often in children
  - Surgery is the standard treatment, followed by radiation therapy to the brain and spinal cord
- Rhabdoid Tumor
  - Rare, highly aggressive and tends to spread throughout the CNS
  - Often appears in multiple sites in the body, especially the kidneys
  - Difficult to classify, may be confused with Medulloblastoma or PNET
  - Surgery followed by radiation therapy and chemo is recommended treatment

## Metastatic Brain Tumors

Cancerous cells from other areas of the body, such as the lungs or the breasts can spread to the brain through the bloodstream and begin to form a secondary, or metastatic tumor. Treatment usually includes surgery and/or radiation therapy.

### Treatment of Brain Tumors

#### A. Surgery

- Craniotomy
  - Surgical removal of the primary tumor is the most direct way to eliminate the bulk of the tumor mass. The surgeon will generally perform a craniotomy – an operation in which the skull cavity is entered by removing a piece of bone to gain access to the brain. The bone is replaced after the procedure. During the procedure, the patient is usually under a general anesthesia.
- Awake Craniotomy
  - Is a craniotomy under local anesthesia. The patient is allowed to return to consciousness after the brain has been exposed. With the patient awake, the surgeon can perform brain mapping. Brain mapping is a procedure that allows the surgeon to identify the eloquent cortex, the areas of the brain that controls important functions such as speech, sensation, and movement. The patient is then given general anesthesia again and the procedure is completed.

Side effects from surgery include, infection, brain swelling, location-related symptoms, e.g.; problems with cognition, speech, vision, hearing, motor function, blood clots, and sensation.

#### B. Radiation Therapy

- Conformal radiation therapy is an external beam of focused radiation aimed at the region containing the tumor.
- Intensity Modulated Radiation Therapy (IMRT). IMRT is a type of radiation designed to restrict the beam to the tumor regardless of the shape. The intensity of the beam may vary throughout in order to protect normal tissues, while delivering

intense radiation. This is accomplished by using multiple beams aimed to intersect at the region of interest.

- Stereotactic Radiosurgery (SRS) is different than conventional radiation therapy. SRS delivers a single, high dose of radiation in a one day session.
- Gamma Knife (GK) radiosurgery is a delivery system that contains 201 sources of radioactive cobalt. It focuses a high dose of radiation to a small target area (usually less than 3.0 cm). GK is most effective when treating tumors that are round to oval in shape and have clean edges.
- LINAC Radiosurgery uses a Linear Accelerator, yet delivers a single high-energy x-ray that is designed by a computer to match the shape of the tumor and avoid healthy tissue.
- Proton Beam Radiosurgery is also called heavy particle radiation therapy. This method uses beams of charged protons produced by a machine called a cyclotron.

Side effects associated with radiation are fatigue, hair loss, short-term memory loss, brain swelling, increased risk for seizures, and location related symptoms, e.g.; problems with cognition, speech, vision, hearing, motor function, and sensation.

### C. Chemotherapy

Chemotherapy drugs are made to kill fast-growing cells, but because these drugs travel throughout the entire body, they can affect normal, healthy cells, too. Because chemo is designed to work this way, rapidly dividing normal cells such as hair follicles, bone marrow, and stomach cells are often afflicted with side effects. These can include baldness, nausea/vomiting, and diarrhea.

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