



Brain Cancer

-Enlightened Men-

**Rishabh Dey, Sourodeep Bhattacharya, Rishiraj
Puspala, and Ayush Pai**

Ardrey Kell High School

*Corresponding author:
Dr. Lopamudra Das Roy
Questions, please reach out:
lopa@breastcancerhub.org*

Abstract

Today, we are going to talk about Brain Cancer, a cancer relatively uncommon compared to other cancers such as breast and lung cancer. As a team we have come up with an informative slideshow on the causes, symptoms, statistics, and other information associated with Brain Cancer. As aforementioned, we bring about this slideshow to inform of these factors of Brain Cancer and spread awareness to other friends, family, and other individuals across the globe. Our methods of research include databases of the following: American Cancer Society and the National Cancer Institute plus a few other cancer awareness oriented organizations. Primarily, most of the research that was collected was in a form of detailed, elaborate articles, which we condensed down so you all as an audience can understand. The research databases information wasn't that hard to comprehend, yet summarizing these sections to present small topics proved to be quite a challenge. We personally recommend to check out these cancer organizations listed above, and interact with experts on these cancers, especially brain cancer, as it is a rarer but very deadly variant of cancer when handled the wrong way.

Introduction

Brain tumor is a rapid growth of cells in your brain. These cells divide very quickly and can disrupt bodily functions and can be life-threatening. These overgrown cells remain unchecked can take over healthy cells by hogging nutrients, space, and food. These tumors can slowly spread into different parts of your body (metastasis). Tumors that don't spread are known as benign tumors and are not cancer and those tumors that spread are cancerous and are known as malignant tumors. There are different stages ranging from I - IV depending on the severity of the tumor where Stage 1 is fairly risk-free and Stage 4 is life-threatening.

Childhood Brain Cancer

Childhood Brain Cancer is a spinal cord tumor which abnormal cells form in the tissues of the brain or the spinal cord. Tests include a physical exam, a neurological exam and a serum tumor marker test.^[1]

- Immunohistochemistry is also implemented in the testing procedure, which uses antibodies to check for antigens.^[1]
- Lumbar Puncture is used to test glucose/ protein level from the fluid between spinal cord bones, and low levels of glucose and high levels of protein can sign a tumor^[1]

Treatments include Radiation Therapy(uses x-rays) and Chemotherapy(uses drugs). Clinical Trials for patient can help scientist discover more treatments. Treatment symptoms include: physical problems, changes in mood, second cancers, appetite loss, and bleeding and bruising^[1]

History of Cancer

- There were myriads of theories that were thought out that were associated with cancer from many millenniums
 - -Before the Common Era(BCE), Hippocrates developed a theory that an excess of a humoral called black bile can cause cancer and possible imbalances of other humors^[1]
 - More similar to modern research would be Johannes Muller's in the 19th century, which proposed that cancer is conceived of cells, but not normal cells, rather budding of normal tissue.^[1]
 - Finally, through figuring out that malignant tumors spread cancer(much earlier before Karl Thiersch found out), Surgeon John Hunter advocated the use of surgery to remove those tumors. Later in the centuries, anesthesia was founded so surgery could flourish^[1]

Concern on Electronic Devices (E.D)

There is major concerns and studies being done regarding the correlation of cancer and electronic devices. The biggest concern is cell phones which emit radio waves which parts of our body can absorb and be extremely harmful for. ^[1]

The radiation emitted is a non-ionizing radiation. While ionizing radiation has been proven to cause cancer, non-ionizing radiation studies are proven inconclusive and the only consistent effect is heat.^[1] (This type of radiation is also used in microwaves.)

Researchers have done many studies to prove/disprove a correlation between malignant brain cancer and cell phone usage and found no significant risk of cancer.^[4]

Studies include:

- Danish Study
- Interphone Study
- Million Women Study
- COSMIC ^{[2][4]}

Types of Brain Cancer

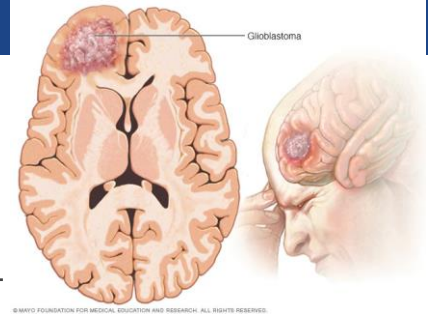
There are roughly 130 different types of brain and central nervous system tumors.^[7]

The most common are:

- Meningioma
- Glioblastoma
- Astrocytoma

Others include:

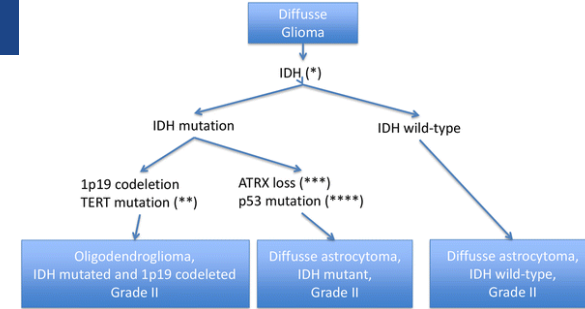
- Acoustic neuroma
- Brain metastases
- Choroid plexus carcinoma
- Craniopharyngioma
- Embryonal tumors
- Ependymoma
- Glioma
- Medulloblastoma
- Oligodendroglioma
- Pediatric brain tumors
- Pineoblastoma
- Pituitary tumors.



Stages/Grades of Glioblastoma

- Brain Cancers are separated into grades, which are categories that differentiate glioblastoma tumors based on their appearance under a microscope and their ability to reproduce.^[10]
- Brain cancers are categorized into Grades 1 through 4, with Grade 4 being the most lethal and aggressive form of the disease.^[10]
- All Glioblastomas are considered to be Grade 4 Cancers because they share many common features:
 - They have an irregular appearance under microscope.^[10]
 - Their rate of mitosis is very high. ^[10]
 - They have their own blood vessels to transport nutrients.^[10]
 - Calcium and cystic materials may collect in the scars formed by tumor growth.^[10]
 - They can easily penetrate nearby healthy tissue. ^[10]

Cause and Development of the Tumor



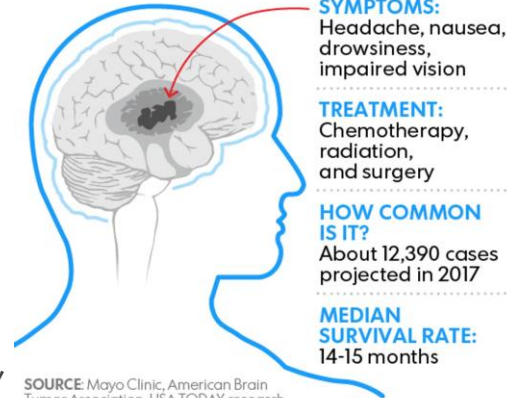
- Two types of Glioblastomas: IDH Wildtype (more common) and IDH Mutant^[10]
 - IDH wildtype: caused by changes to entire chromosomes; most often, the 7p chromosome is added, while chromosome 10q is lost. ^[10]
 - IDH mutant: caused by smaller mutations in the IDH1 or IDH2, causing many of the cell's functions to be altered. ^[10]
- Glioblastoma tumors are made up of astrocytic cells (cancer cells), blood vessels, and necrosis (groups of dead cells).^[10]
- Tumors can spread to other parts of the brain using the corpus callosum.^[10]
- Glioblastomas can appear directly as Grade 4. These types of tumors are known as “de novo” and they are most common in older patients.^[10]
- In some cases, genetic testing has shown that the risk of glioblastoma is inheritable^[6].

Diagnosis and Prognosis

- Symptoms of glioblastomas include increased pressure in the brain, which can cause headaches, nausea, and vomiting. In addition, certain muscles may be unable to function and the patient might have trouble with balance, and memory. Lastly, some patients may suffer from seizures. ^[10]
- Certain molecular markers, such as the IDH gene and the MGMT gene, that are already present in the patient may also affect prognosis. ^[10]
 - For patients with IDH-wildtype glioblastoma, the median survival is usually about 11-15 months after diagnosis. ^[10] IDH-mutant glioblastoma patients, meanwhile, are expected to live 27-31 months after diagnosis. ^[10]

GLIOBLASTOMA

WHAT IT IS: An aggressive type of brain cancer that starts in the glial cells of the brain and spreads rapidly throughout the brain.

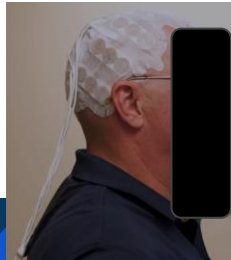


SOURCE: Mayo Clinic, American Brain Tumor Association, USA TODAY research
Janet Loehrke and George Petras, USA TODAY



Treatment

- In order to treat glioblastoma, doctors will try to remove the tumor through surgery first. ^[11]
- However, if a tumor is in its later stages of development, then it will branch out in all directions, making surgery a difficult and risky task, especially when the tumor has spread to parts of the brain that control important functions (speech, movement, coordination). ^[11]
- Radiation and chemotherapy are the most common methods of removing tumors that cannot be removed without surgery. ^[11]
- Tumor Treating Fields can also be used with chemotherapy. ^[11]
 - In this method, ceramic disks are placed on the scalp. These disks use low-intensity electrical fields to stop mitosis and destroy cancerous cells. Patients must wear these disks for 18 hours a day, and must replace the disks every 4-7 days. ^[11]





Signs and Symptoms

- New onset or change in pattern of headaches.
- Headaches that gradually become more frequent and more severe.
- Unexplained nausea or vomiting.
- Vision problems, such as blurred vision, double vision or loss of peripheral vision.
- Gradual loss of sensation or movement in an arm or a leg.
- Difficulty with balance.
- Speech impediments.
- Confusion in everyday matters.
- Personality or behavior changes.
- Seizures, especially in someone who doesn't have a history of seizures.
- Hearing problems. ^[12]

Even if you may experience these things, remember, it may not be brain cancer just because you may have a few of the symptoms listed above.

Image Source: Shutterstock

Statistics Of Brain Cancer

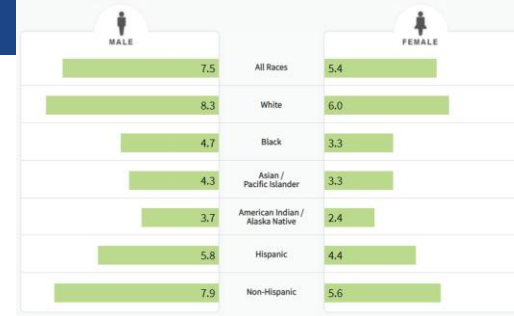
- About 23,820 malignant tumors of the brain or spinal cord (13,410 in males and 10,410 in females) will be diagnosed. These numbers would be much higher if benign (non-cancer) tumors were also included. ^[13]
- About 17,760 people (9,910 males and 7,850 females) will die from brain and spinal cord tumors. ^[13]
- The 5 year Survival Rates for Glioblastoma is 19 percent for 20-44 years old, 8 percent for 45-54 years old, and 5 percent for 55-64 years old. ^[14]
 - The 5 year Survival Rate is basically the amount of people who survive with a certain type of disease after 5 years.

Women Vs. Men Frequency

- The risk for men (about 1 in 143) is slightly higher than that for women (about 1 in 185), although certain types of tumors are more common in women. ^[15]
- Using this info, a good way that we can further curb the growth of Glioblastoma and other Brain Cancers may be reliant on Gender Specific Treatments,
 - Low levels of genes involved in proliferation were linked to longer survival in male patients and greater sensitivity to chemotherapy in a dish.
 - Low levels of genes involved in cell migration were associated with longer survival in female patients and increased sensitivity to the same chemotherapy in a dish.



Demographics of Brain Cancer



- By looking at these two graphs, we can tell that Men have a higher chance of getting brain cancer, and by a pretty substantial amount of about 21 percent. [15]
- Hispanics seem to have a higher amount of cases of Brain Cancer compared to other races, this might be due to the environment sources or a genetic cause.
- Taking a look at the second graph, we can see that the average age of people getting diagnosed with Brain Cancer is about 59 years olds. [15]

Helpful Resources

Major Cancer Facilities^[5]

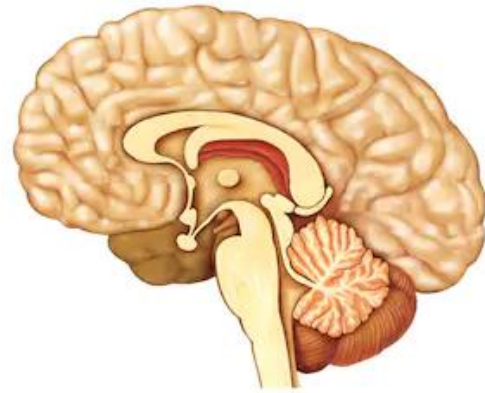
- Abramson Cancer Center
- Cancer Research Institute
- Koch Institute For Integrative Cancer Research
- Albert Einstein Cancer Center

Cancer Support Hotline ^[8]

- 1-888-793-9355

Financial Resources^[9]

- CancerCare
- HealthWell Foundation
- Cancer Financial Assistance Coalition
- Cancer Finances



Reference

Cancer .gov [1](National Cancer Institution

cancer.org[2] (American Cancer Society)

muditalab.com[3](Microwave Radiation Harmful)

ncbi.nlm.nih.gov [4]

topmastersinhealthcare.com[5]

ncbi.nlm.nih.gov [6]

braintumor.org[7]

cancersupportcommunity.org[8]

cancer.net[9]

https://www.abta.org/tumor_types/glioblastoma-gbm/[10]

<https://www.abta.org/about-brain-tumors/treatments-sideeffects/#treatments>[11]

<https://www.mayoclinic.org/diseases-conditions/brain-tumor/symptoms-causes/syc-20350084> [12]

<https://www.cancer.org/cancer/brain-spinal-cord-tumors-adults/about/key-statistics.html>
[13]

<https://www.cancer.net/cancer-types/brain-tumor/statistics> [14]

<https://seer.cancer.gov/statfacts/html/brain.html> [15]