The Psychological Effect of Brain Cancer and the Treatments on Patients

Gabriela Reeis

November 13, 2024

Abstract:

In America today, brain cancer is the fifth most common cancer and more than 1 million people in the US are living with it[1]. There are more than 100 different kinds of primary brain tumors[1]. There are many different ways to treat brain cancer including surgery, radiation therapy, chemotherapy, proton beam radiation therapy, laser interstitial thermal therapy (LITT), and carmustine implants [2]. Among these, surgery is the most common treatment plan for brain cancer patients [3]. Brain cancer treatments have a significant psychological effect on patients that can cause a wide range of changes in their behavior. These effects include mood disorders, depression, personality changes, psychotic disorders, changes in memory, and changes in focus [4]. This is a huge problem because cancer patients undergoing these treatments are not getting proper supportive care and the help they need to deal with the changes in their bodies. This study aims to provide families dealing with cancer, cancer patients, cancer survivors, and the healthcare system the knowledge they need to implement more support into the world of healthcare to allow people to understand these psychological changes and how to deal with them. After brain cancer treatments, patients should expect to experience a series of psychological and behavioral differences in their everyday lives.

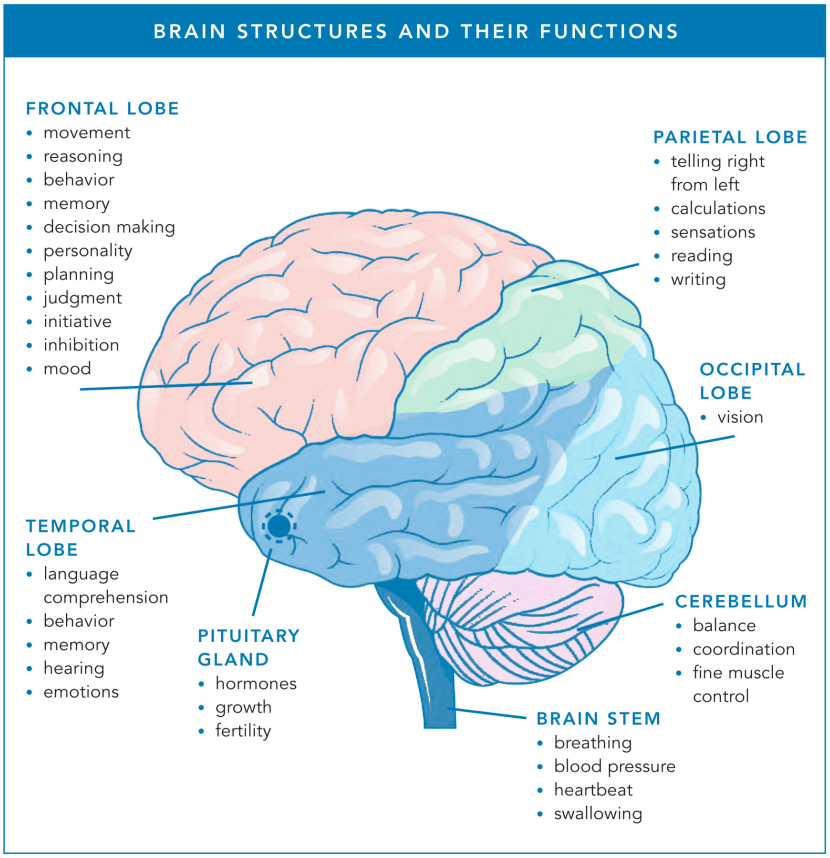
Introduction:

[1] Brain tumor faqs - learn more or donate today!: Abta. American Brain Tumor Association. (2024, October 22). https://www.abta.org/about-brain-tumors/brain-tumor-education/#:~:text=These%20are%20the%20most%20common%20brain%20tumors.&text=Unless%20otherwise%20specified%2C%20the%20follow,tumor%20location%2C%20and%20molecular%20markers

[2]Brain cancer: Causes, symptoms & treatments (no date) Cancer Council. Available at: https://www.cancer.org.au/cancer-information/types-of-cancer/brain-cancer (Accessed: 23 October 2024).

[3] *Brain tumors and brain cancer* (no date) *Johns Hopkins Medicine*. Available at: https://www.hopkinsmedicine.org/health/conditions-and-diseases/brain-tumor (Accessed: 23 October 2024).

[4]*PubMed* (no date) *National Center for Biotechnology Information*. Available at: https://pubmed.ncbi.nlm.nih.gov/ (Accessed: 23 October 2024).



Based on an illustration from National Brain Tumor Society's *The Essential Guide to Brain Tumors* [5]

The image above describes the different functions of the brain to demonstrate how each structure could be significantly impacted during and after brain cancer.

Brain cancer is a life-threatening disease that occurs when abnormal cells in the brain or nervous system grow and multiply rapidly, disrupting how a normal brain should function[6]. Brain cancer can be caused by malignant tumors, which are masses of abnormal cells that spread and invade other tissues. It can also be caused by metastatic brain tumors, which are tumors that spread to the brain from other parts of the body. Brain cancer can affect many parts of the brain, including the brain tissue, the pituitary gland, the pineal gland, and the membranes that cover the brain[7]. Brain cancer not only affects the part of the brain near the tumor but can also increase pressure inside the skull, called intracranial pressure. This can be caused by the tumor, swelling, or blocked cerebrospinal fluid. Tumors can also destroy healthy

[5] Signs & Symptoms. (n.d.). National Brain Tumor Society. Retrieved November 5, 2024, from https://braintumor.org/brain-tumors/diagnosis-treatment/signs-symptoms/
[6] Brain Tumors and Brain Cancer. (n.d.). Johns Hopkins Medicine. Retrieved November 1, 2024, from https://www.hopkinsmedicine.org/health/conditions-and-diseases/brain-tumor
[7] Brain tumor - Symptoms and causes. (2023, April 21). Mayo Clinic. Retrieved November 1, 2024, from https://www.mayoclinic.org/diseases-conditions/brain-tumor/symptoms-causes/syc-20350084

brain tissue, or change the function of surrounding tissue[8]. Symptoms of brain cancer can range depending on the kind but mainly include severe headaches, seizures, nausea and vomiting, vision changes, weakness or paralysis in one side of the body, loss of balance, personality or behavior changes, confusion, memory problems, difficulty speaking, and drowsiness, with the specific symptoms depending on the location of the brain tumor[7].

There are many treatments to eliminate or alleviate brain cancer such as surgery to remove the tumor, chemotherapy, and radiation therapy. Brain tumor surgery is a procedure to remove a brain tumor or reduce pressure in the skull. The common kind of brain tumor surgery is a craniotomy or neuroendoscopy. A craniotomy is when a surgeon makes an incision in the scalp and removes a piece of the skull to access the brain. Also known as keyhole brain surgery, neuroendoscopic procedures involve making a small hole in the skull and inserting an endoscope to remove the tumor[9]. Next, chemotherapy is a cancer treatment that uses drugs to kill cancer cells or prevent them from multiplying. Chemotherapy drugs stop cancer cells from reproducing, preventing them from growing and spreading. Chemotherapy can be used to cure cancer, shrink tumors, or make other treatments more effective. It can also be used to treat metastatic cancer, which is cancer that threatens to spread through the bloodstream[10]. Lastly, radiation therapy is a cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumors. Radiation therapy can be delivered externally or internally. Radiation therapy can damage normal cells as well as cancer cells, so treatment is carefully planned to minimize side effects[11]. In conclusion, many kinds of cancer treatments can have different effects on the patient, and this paper will go into more detail about those effects.

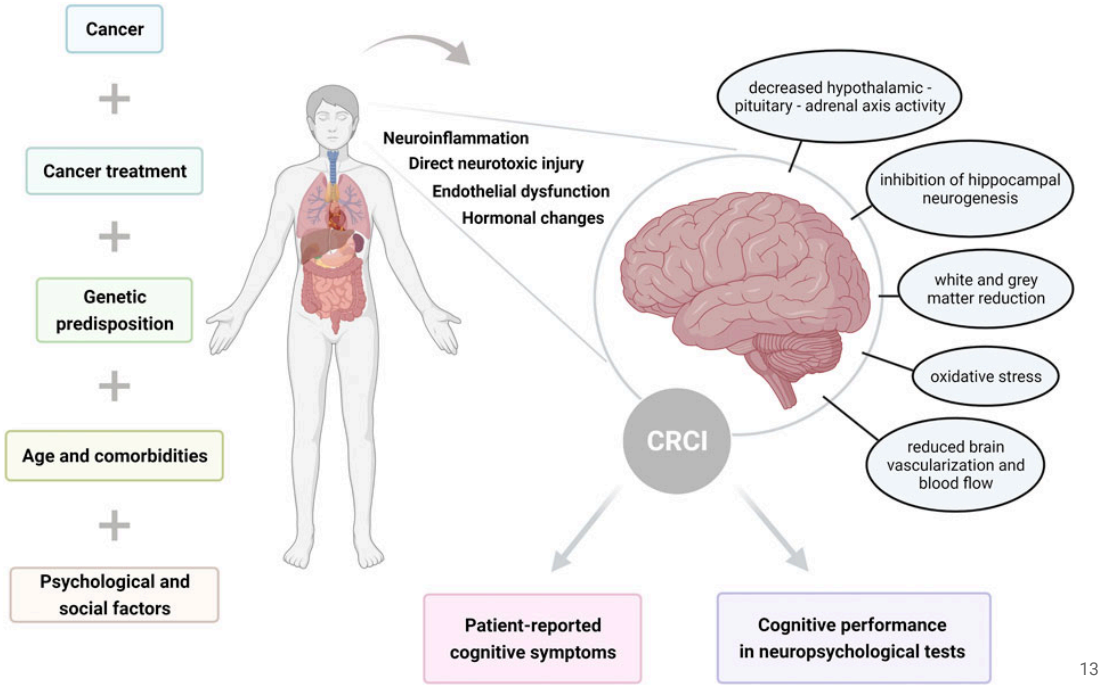
What a Patient Should Expect Post-Brain Cancer Treatments:

Brain cancer patients undergoing treatment should expect to experience psychological and behavioral changes. Symptoms of cognitive impairment, also known as “chemo brain” are a major effect of brain cancer treatments. The most common cancer treatments that can raise the chances of changes in the psychological and behavioral aspects of a patient can include chemotherapy, surgery, radiation,

[8] Signs and Symptoms of Adult Brain and Spinal Cord Tumors. (2020, May 5). American Cancer Society. Retrieved November 5, 2024, from https://www.cancer.org/cancer/types/brain-spinal-cord-tumors-adults/detection-diagnosis-staging/signs-and-symptoms.html
[9] Brain Tumor Surgery. (n.d.). Johns Hopkins Medicine. Retrieved November 5, 2024, from https://www.hopkinsmedicine.org/health/conditions-and-diseases/brain-tumor/brain-tumor-surgery
[10] Overview - - - Chemotherapy. (n.d.). NHS. Retrieved November 5, 2024, from https://www.nhs.uk/conditions/chemotherapy/
[11] Radiation Therapy for Cancer - NCI. (2019, January 8). National Cancer Institute. Retrieved November 5, 2024, from https://www.cancer.gov/about-cancer/treatment/types/radiation-therapy

immunotherapy, targeted drug therapies, or hormone therapies. If these changes go untreated, it can lead to long-term damage to the brain.

Patients who have experienced any of those treatments to specifically treat brain cancer should expect to experience brain fog, depression, anxiety, trouble focusing, and personality disorders, which can eventually lead to serious conditions such as Alzheimer's or Dementia. These effects can be lifelong[12]. In the paragraph below, the paper will cover how each of the most common treatments have different effects on the patient.



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This image depicts the factors that can lead to cognitive decline from brain cancers

Different Psychological Effects on the Patient Based on Treatment:

Chemotherapy, radiation therapy, and surgery treatments each have different psychological effects on patients. Surgery for brain cancer is known to cause cognitive deficits, but this decline in

[12] Coomans, M.B. et al. (2019) Treatment of cognitive deficits in brain tumour patients: Current status and Future Directions, Current opinion in oncology. Available at: https://pmc.ncbi.nlm.nih.gov/articles/PMC6824580/#:~:text=Depending%20on%20the%20tumour%20type,pharmacological%20treatment%20and%20cognitive%20rehabilitation. (Accessed: 23 October 2024).
[13] Long-Term Cognitive Dysfunction in Cancer Survivors. (n.d.). Frontiers. Retrieved November 5, 2024, from https://www.frontiersin.org/journals/molecular-biosciences/articles/10.3389/fmolb.2021.770413/full

cognitive abilities actually increases after surgery while still being considered below normal. Cognitive deficit is the impairment of a patient's mental ability.

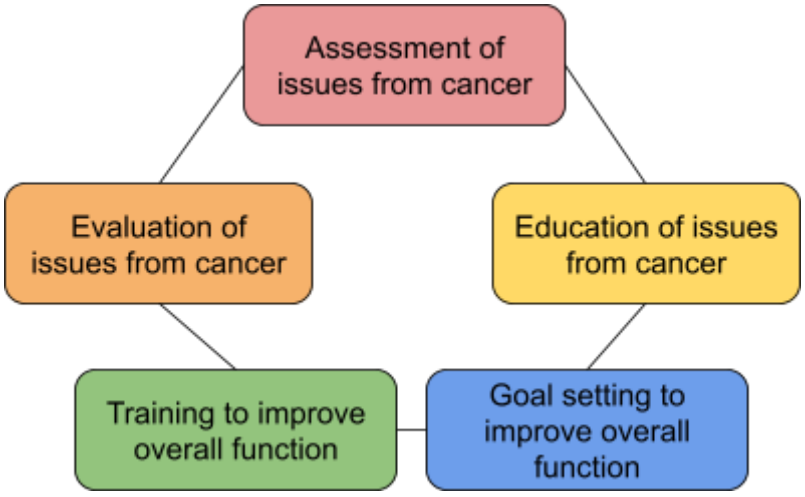
In addition, in radiation therapy, there is a cognitive disability in 50–90% of the patients, occurring in the acute phase, which is during radiation, early-delayed, which is shortly after radiation, and late-delayed, which can be years after radiation. These symptoms are headaches, nausea, dizziness, and cognitive deficits such as functional ability including memory. In late-delayed radiation therapy, these symptoms can be worsening and irreversible. Lastly, chemotherapy has been proven to be less harmful than radiation while still containing the possibility of short or long-term cognitive deficits. Common cognitive symptoms resulting from chemotherapy include learning, memory, information processing speed, and executive functioning also known as "'chemo brain"[8]. The paragraph below will cover how patients can overcome the drastic changes from brain cancer treatment.

How a Patient can Overcome these Psychological Changes:

There are ways that a patient can overcome these psychological and behavioral changes that result from brain cancer treatments. Even though brain cancer treatments can come with such long-term damage, there are ways to help try to ease the psychological changes a patient may experience. A common way to heal is through cognitive rehabilitation therapy, which refers to a set of mediations that aim to improve a person's ability to perform cognitive tasks by taking in previously learned skills and teaching strategies.

Cognitive rehabilitation begins with a neuropsychological test to look for cognitive strengths and weaknesses and the amount of change in cognitive ability following brain cancer treatment. The results of the test are used to come up with an appropriate treatment plan. Common plans for improvement in attention, memory, and executive function are reviewed. Cognitive rehabilitation is efficient for any type of brain cancer treatment and has proven to be very beneficial. This therapy will continue to be used more commonly throughout 2024 and into 2025[14].

[14] Tsaousides, T., & Gordon, W. A. (2009). Cognitive rehabilitation following traumatic brain injury: assessment to treatment. The Mount Sinai journal of medicine, New York, 76(2), 173–181. https://doi.org/10.1002/msj.20099



This image shows the cycle of cognitive rehabilitation therapy with the overall goal of returning to as much cognitive function as possible

Conclusion

In conclusion, patients going through brain cancer treatments should expect to experience major psychological changes. The healthcare industry needs to bring more awareness to this issue because patients are not getting the support they need to move forward with their lives after this life-changing illness. The findings in this article cover the kinds of psychological changes a patient should expect such as cognitive decline and how surgery, radiation therapy, and chemotherapy have different effects. This article also provides a solution to help overcome these changes such as cognitive rehabilitation therapy, which aims to help patients achieve a better state of mind.

There are exceptions to this article because not all patients will experience serious changes. However, up to 90% of brain cancer treatments do experience these symptoms, making it a major issue to learn to adapt to. There is much significance to this topic. Most brain tumor patients rely on family members for support. Family members' support can be impactful, but also leads to a significant burden from the patient's unmet needs. Doctors who work with cancer patients should work with the patient after their treatment to help them through what they need[15]. If doctors do not help patients through these changes, the patients should at least get the proper education they need to move forward and return to their lives. In the future, brain cancer patients should work one-on-one with a neuropsychologist, or someone similar, to feel like they have the support they need which will lead to less depression overall.

[15]Treatment of cognitive deficits in brain tumour patients: current status and future directions. (n.d.). PubMed Central. Retrieved November 9, 2024, from https://pmc.ncbi.nlm.nih.gov/articles/PMC6824580/

This article hopes to educate patients and healthcare workers on the psychological impact of brain cancer treatments.