



Review Article

Brain Tumors: Signs, Detection, and Treatment

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ABSTRACT

Among all types of cancer, brain tumor is a rare type of cancer but it is deadliest cancer. These tumors are difficult to treat, due to protected in the hard skull. All abnormal cell are not tumors but some of which can lead cancer. Around 50-60% patients of brain tumor are getting well due to advanced technology. Radiation therapy and chemotherapy play important roll to treat brain tumors, with help of MRI images tumors can be detected and treated. Right method of segmentation must use to divide patient to give them proper treatment. Region growing and clustering algorithm are commonly used region based segmentation techniques. Manual segmentation of brain tumor from magnetic resonance is non-invasive and time consuming. Computer assisted diagnosis machine learning and deep learning allow to radiologist to identify brain tumors. In recent years deep learning solve image classification, semantic segmentation and object detection.


INTRODUCTION

Brain is important organ that control memory, emotions, regulate the body. A tumor is abnormal tissue that grows uncontrollably cell division. Tumor is abnormal growth formed in any tissue in cranium which also includes cranial nerves, meanings, skull, pituitary gland and pineal gland. Treatment of brain tumors different according to tumor types, location and size. There are more than 120 types of brain tumor[1]. There are 2 main types of tumor malignant tumor and benign (non cancerous) tumor. Cause of brain tumors is unknown 4% brain cancer caused by CT scan

radiation[2]. Primary brain tumor start from tissue of brain or its surrounding. Metastatic tumor affect nearly 150,000 people a year. About 40% people having lung cancer have changes to happen metastatic brain tumor. Now a day advance diagnostic tool and radiation technology increasing survival rates[3]. Early diagnosis and treatment can prevent permanent damage to the brain or death of patients. There are treatment that include corticosteroid, surgery, chemotherapy whole brain radiation therapy and stereotactic radiosurgery[4]. Malignant brain tumors cells high grade astrocytoma's fastly attaches neighboring

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cell in brain have rapid progression rate. WHO categorized tumors in four types of grades also classified by their stage of progression stage stage 0,1,2,3,4. Stage 1,2,3 shows cells are cancerous and increasing rapidly. In the 4th stage cancer spreads thoroughly the body. Many lives can be saved if it is detected in early stages and effective diagnosis and treatment. At higher stages it is very difficult to treat cancer where survival rate is low. Brain tumor diagnosis are of 2 type invasive or non invasive [5]. The greatest proportion of tumors are supratentorial, arising in frontal ,temporal and parietal lobes and 86% gliomas which include astrocytomas, glioblastomas and unspecified gliomas[6].

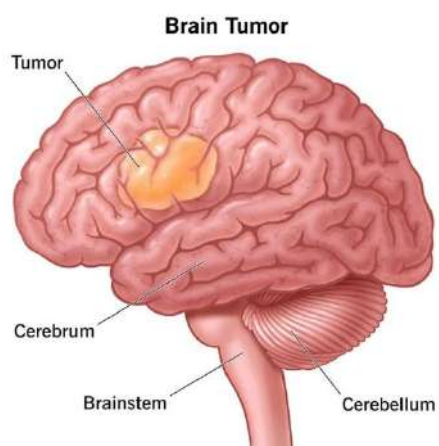


Fig 1. Brain tumor

Types:

1. Meningioma

It is most common primary brain tumor. It is more than 30% of all brain tumors. It originate in meninges, covered by 3 layers and protect brain under the hard skull. 85% of meningioma's is non cancerous and it grow slowly.

2. Pituitary adenoma

this type of tumor grown in gland tissues. About 10% brain tumor are adenomas. They can be treated with surgery and medication

3. Choroid plexus tumor

It is rare type of tumor and found in choroid plexus which produce cerebrospinal fluid. Occurs mostly

in children under age of . This result in increase pressure on brain.

4. Pysembryoplastic neuroepithelial tumor

This tumor is made up of mix neurons and their supporting cells. Found in teenagers these can cause seizures[7].

5. Glial cell

- A. Astrocytic tumors: originates in the cerebrum
- B. oligodendroglioma tumor: found in frontal temporal lobe
- C. Glioblastomas: originates in supportive brain tissue and most aggressive type[8].

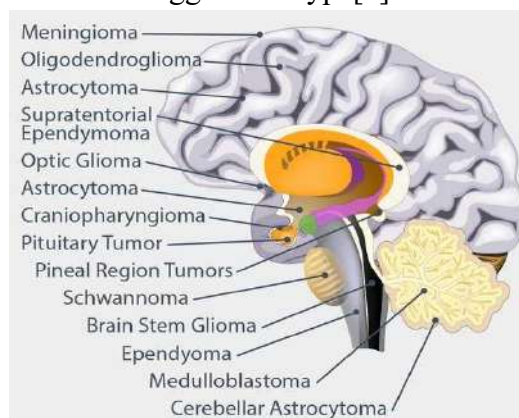


Fig 2. Types of brain tumor

Risk factor:

1. Exposure to infection, viruses and allergens
Epstein -Barr virus [EBV] increase risk of nervous system lymphoma. Researchers found high level of virus named cytomegalovirus found in brain tumors tissue.
2. Ionizing radiation
X-rays have been shown risk factor for brain tumors. Nuclear power plant incidents in Fukushima and Chernobyl are examples.
3. Head injury and seizures
Head injury trauma showed have relationship to brain tumor [9]. 1% people in united kingdom every year founded brain tumor.
4. Overweight
Having obesity increase risk of brain tumor called meningitis. About 2 out of 100 brain tumor patients diagnosed every year in united kingdom.
5. Family history and genetic conditions

A patients relative who had brain tumors have chances of brain tumor. Genetic conditions affect genes. People who have one of them syndrome have increased risk.

- . Turner syndrome
- . Tuberous sclerosis
- . Tricot syndrome
- . Gorlin syndrome[10]

Symptom: -

Headache, vomiting, confusion, seizures, change in mental functioning, clumsiness, memory loss, change in ability to hear, taste smell, dizziness, vertigo, loss of balance, muscle weakness[11].

Diagnosis: -

1. Magnetic Resonance Imaging (MRI)

Intraoperative MRI used during surgery to guide tissue biopsies and tumor removal. Magnetic resonance spectroscopy (MRS) used to examine lesion nature and chemical profile. MRI produces detailed images inside body using magnetic fields not x-ray. There are different types of MRI. Neuro-examination done by neurologist, that helps to determine which type of MRI to be use. MRI technique called ‘‘diffusion weighted imaging’’ shows brains cellular structure. A Functional MRI give information about location in the brain that are responsible for speech and muscle movement.[12]

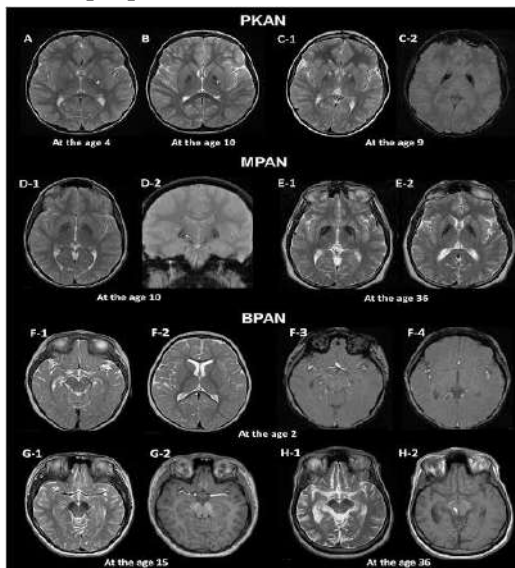


Fig 3. MRI scan images

2. CT scan

CT scan taken pictures of the inside body using x rays taken from different angles. A computer combines pictures into 3 dimensional image that shows abnormalities or tumors changes in bone also seen by CT scan. Changes to bone in the skull seen on CT scan and it measure tumor size.[13]

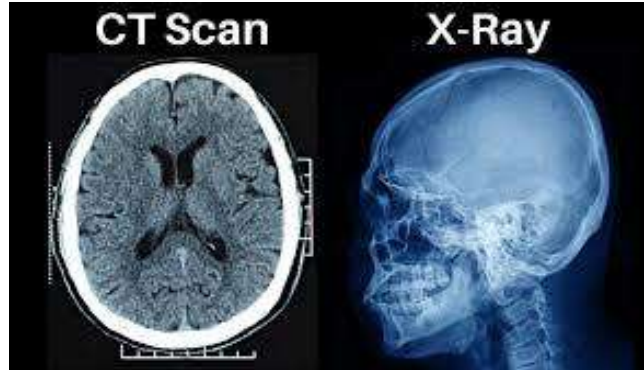


Fig 4. Difference between CT scan and x-ray

Treatment: -

The treatment of brain tumors typically involves a combination of therapies tailored to the specific type, location, and stage of the tumor, as well as the patient's overall health. Here's an overview of the main treatment options:

Surgery: This involves removing as much of the tumor as possible. Surgeons aim to preserve healthy brain tissue while extracting the tumor.[14]

Radiation therapy: High-energy X-rays or other forms of radiation are used to target and kill cancer cells. This can be used as the primary treatment or after surgery to eliminate remaining cancer cells.[15]

Chemotherapy: Medications are administered to destroy cancer cells or inhibit their growth. These drugs can be taken orally or intravenously.

Targeted therapy: This treatment option focuses on specific molecular or genetic aspects of the tumor to block its growth or spread.[16]

Immunotherapy: Some brain tumors may be treated with immunotherapies, which boost the body's immune system to recognize and attack cancer cells.[17]

Stereotactic radiosurgery: This precise form of radiation therapy, such as gamma knife or cyberknife, delivers a high dose of radiation to a specific area of the brain.

Supportive care: Patients may receive treatments to manage symptoms, alleviate side effects, and improve their quality of life.[18]

The choice of treatment depends on factors like the tumor type, size, location, and the patient's overall health. Often, a multidisciplinary team of healthcare professionals collaborates to determine the most appropriate approach. It's important for patients to discuss their options with their healthcare providers to make informed decisions about their treatment plan.[19]

CONCLUSION

This comprehensive review sheds light on the complex landscape of brain tumors. It has covered various aspects, from the types and causes and risk factors symptoms, diagnostic methods, and treatment options. Brain tumors are a multifaceted challenge, often affecting patients physically, emotionally, and mentally. Early detection is paramount, as it can significantly impact the prognosis and the quality of life for those diagnosed. Advances in medical research and technology are offering new hope for improved treatments and outcomes. Collaborative efforts between patients, caregivers, and healthcare professionals are essential in the battle against brain tumors, ensuring that individuals receive the most appropriate and personalized care. While much remains to be understood and achieved in this field, this review underscores the importance of continued research and support for individuals facing the challenges of brain tumors.

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