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Review on Primary Brain Tumor Diagnosis and Treatment Strategies

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Abstract:

The brain tumor accounts for 2 percent among all cancers in adults from across the globe. The most common brain tumor is glioblastoma multiforme, and patients with this type of tumor have a poor prognosis. The exposure to high ionizing radiation has only proven to be a one of risk factor for brain tumor. The classification of brain tumor is done depending upon their cellular origin and histological appearance. The typical symptoms of brain tumor include headache, seizures, nausea, vomiting, neurocognitive symptoms, and personality changes as well. The diagnosis of brain tumor is done by imagining and is confirmed by study of histopathology. Any person with chronic, persistent headache in association with protracted nausea, vomiting, seizures, change in headache pattern, neurologic symptoms, or positional worsening should be evaluated for a brain tumor. MRI is used technology for the primary imagining study of sample. A comprehensive neurosurgical evaluation is necessary to obtain tissue for diagnosis and for possible resection of the tumor. The primary stage brain tumor hardly metastasizes outside central nervous system, and no standard method is yet developed to identify it. Surgical resection of the tumor is the mainstay of therapy. Postoperative radiation and chemotherapy have improved survival in patients with high-grade brain tumors. Recent developments in targeted chemotherapy provide novel treatment options for patients with tumor recurrence. This is

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review study is focused on the primary stage brain tumors and available treatment strategies to control the level of infection.

Keywords: Brain tumor, CNS, Chemotherapy, Seizures, headache

Introduction:

The brain tumor is rare type of cancer among all its different types, which accounts approximately about 2% among all its different types. According to The AmericanCancer society more than 20000 new patients of brain and nervous system cancer which causes 15000 deaths each year in United States. The data from surveillance epidemiology and results program showed an age incidence of 6.4 per 100000 persons in 2003 and 5.85 per 100000 persons in year 1975. (chandana, 2008).

Table.1 Presenting Signs and Symptoms in Patients with Primary Brain Tumors

Sign or symptom	Percentage with the sign or symptom
Headache	56
Memory loss	35
Cognitive changes	34
Motor deficit	33
Language deficit	32
Seizures	32
Personality change	23
Visual problems	22
Changes in consciousness	16
Nausea or vomiting	13
Sensory deficit	13
Papilledema	5

Risk Factors:

Many of tumors of central nervous system are associated with genetic and hereditary conditions, most commonly autosomal dominant disorder of neurofibromatosis . Patients with neurofibromatosis have the number of dermatological manifestations such as dermatological and may increase the risk of optic gliomas and astrocytomas. Environmental factors like ionizing radiations, occupational exposures, electromagnetic pesticide, cellular telephones and nitroso compounds also responsible for the brain tumor as well.

Table2. Risk Factors for Primary Brain Tumors

Environmental	Genetic
High-dose ionizing radiation	Li-Fraumeni syndrome (P53 mutation)
Alcohol use	Multiple endocrine neoplasia type 1

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Cellular telephones	Neurofibromatosis 1 and 2
Chemical agents (e.g., hair dyes, solvents, pesticides, traffic-related air pollution)	Nevoid basal cell carcinoma syndrome
Extremely low-frequency electromagnetic fields Head trauma or injury	Tuberous sclerosis
Infections (e.g., viruses, Toxoplasma gondii, in utero influenza, varicella)	Turcot's syndrome
Nitrosamine, nitrosamide, nitrite, nitrate, or aspartame consumption	Von Hippel-Lindau disease
Occupational exposures (e.g., rubber, vinyl chloride, petroleum)	
Tobacco use	

Diagnosis:

In the early stage of infection the symptoms are focal , symptoms becomes visible with increase in the size of tumor. A common symptom includes nausea, vomiting, headache, seizures, and personality change that is mental dysfunctions. A available study state that about 80% of patients with brain tumor reports of dull tension type headache. About 60% of patients suffer from headache which lasts for more than six months, where headache is also often associated with other symptom which includes seizure, visual disturbances and nausea and vomiting and those persons who are suffering from these should be evaluated with brain tumor. Seizure is the common in patients with low grade gliomas. The type of seizure and its associated neurologic symptoms vary with tumor locations. In the initial stage of brain tumor one third groups of patients suffer with nausea and vomiting along with headache seizures and cognitive dysfunction. Symptoms of cognitive dysfunction includes memory loss, change in attention, orientation, language speaking abilities, change in executive function, change in personality and daily activities. Cognitive dysfunctions are associated with the tumors originating from dominant hemispheres rather than that of non dominant hemispheres. Cognitive dysfunctions are usually progressive even after the aggressive treatment and can be diagnosed by study of medical history and physical examination, funduscopy,focused neurological examination evaluating mental status, cranial nerves, motor, sensory and deep tendon reflexes should be performed.

Diagnostic Neuroimaging:

The diagnosis of brain tumor begins with brain imaging which is then followed by study of tissue that is histopathology to confirm the disease. Following table explains Imaging Modalities for the Management of Primary Brain Tumors

Table.3 Diagnostic Neuroimaging

Modality	Uses
CT	Localizing the tumor and defining its dimensions, morphology
MRI	Localizing the tumor and surrounding structures with a high-resolution

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	image, diagnosis of supra- and subtentorial tumors, diagnosis of extra- and intra-axial tumors, presurgical planning with three-dimensional imaging, stereotactic biopsy, radiotherapy
DTI	Establishing spatial relationships between tumor border and white matter, assessing the progression and regression of white matter tracts caused by tumor growth or resection
fMRI	Neurosurgical planning and neurologic risk assessment by localizing the cortical regions that control language, motor, and memory functions
MRA	Understanding tumor vascularity and identifying the anatomic relationship between the tumor and blood vessels
MRS	Obtaining biochemical and metabolic information about the tumor, determining tumor type and grade by assessing the cellular contents, differentiating tumor from radiation necrosis
PET	Metabolic assessment of tumor aggressiveness (grade), assessing the highly metabolic areas within the tumor, differentiating between tumor recurrence and radiation necrosis, functional localization of cortical regions, predicting patient survival and prognosis

Staging:

There is no staging system developed for the primary brain tumor which spread to the different parts of brain and spinal cord via cerebrospinal fluid. The presence of cerebrospinal fluid can be determined by analyzing the fluid. The metastasis of the cancer outside CNS is rarely seen.

Treatments:

Surgery:

A proper neurological evaluation is important to obtain a tissue for diagnosis of the tumor. Surgery is the treatment of choice for primary brain tumor if the patient is candidate for complete resection. Intracranial tumors that occur outside the brain such as pituitary adenomas, schwannomas, and meningiomas can be cured by surgery. The decision of the surgery is dependent on the location, size of the tumor plaque, histopathology of tumor and the comorbid conditions of patients. Asymptomatic patients can be followed up with CT scan for regularly. In the patients having high grade gliomas or tumor plaque it is important to decrease the tumor burden, relieving intracranial pressure and improving the survival of patient.

Radiation Therapy:

High grade gliomas are treated with radiation after the surgery. The radiation can be delivered to tumor either internally or externally. The external radiation therapy includes conventional and stereotactic radiation therapy. Standard external radiation therapy includes 20-30 daily treatments administered for 5-7 weeks. The dose depends on factors like age, growth and location of tumor, histology and grade of infection. Stereotactic radio surgery often delivers a single high dose of radiation in a one-day session, but it can be administered in two or three large doses.

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Chemo Therapy:

The recent advancement in the chemotherapy makes it a choice of treatment for the treatment of primary brain tumors. Combining temozolomide (Temodar) therapy with radiation improves survival inpatients with high grade gliomas. The chemo therapeutic agents like irinotecan and targeted agents such as bevacizumab which targets the epidermal and platelet derived growth factor receptors have shown promising treatments against recurrent gliomas.

Table.4 Standard Treatment for Different Primary Brain Tumors

Tumor	Treatment
Astrocytoma, anaplastic	Surgery and radiation
Astrocytoma, high grade	Surgery and radiation, optional chemotherap
Astrocytoma, noninfiltrating	Surgery, optional radiation
Brain stem glioma	Radiation
Craniopharyngioma	Surgery, optional radiation
Ependymoma	Surgery, optional radiation
Ependymoma, anaplastic	Surgery and radiation
Glioblastoma multiforme	Surgery, radiation, and chemotherapy
Medulloblastoma	Surgery, optional radiation
Meningioma	Surgery, optional radiation
Meningioma, malignant	Surgery and radiation
Mixed glioma	Surgery and radiation, optional chemotherapy
Oligodendroglioma	Surgery, optional radiation
Oligodendroglioma, anaplastic	Surgery and radiation, optional chemotherapy
Pineal parenchymal tumor	Surgery and radiation, optional chemotherapy
Primary CNS lymphoma	Radiation and chemotherapy

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Author contribution

Rohit Kale: Conceptualization, Data study, Visualization, Writing - Original Draft, Writing - review & editing.

Declaration of competing interest

All authors report no conflicts of interest relevant to this article.

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