Diffuse midline glioma

- Targeting the CD40 costimulatory receptor to improve virotherapy efficacy in diffuse midline gliomas
- From Seeing to Healing: The Clinical Potential of Radiotracers in Pediatric Neuro-Oncology
- Small Extracellular Vesicles from Radioresistant H3K27M-Pediatric Diffuse Midline Glioma Cells Modulate Tumor Phenotypes and Radiation Response
- Cholinergic neuronal activity promotes diffuse midline glioma growth through muscarinic signaling
- Defining the extracellular matrix for targeted immunotherapy in adult and pediatric brain cancer
- Comprehensive molecular characterization of adult H3K27M mutated thalamic glioma long-term survivors
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A diffuse midline glioma is a type of brain tumor that occurs in the central part of the brain and typically affects structures along the midline, such as the brainstem and thalamus. These tumors are highly aggressive and invasive, making them difficult to treat. Here are some key points about diffuse midline gliomas:

Location: These gliomas primarily develop in the midline structures of the brain, including the pons (a part of the brainstem), thalamus, and spinal cord. They can also involve adjacent structures like the medulla oblongata and the tectum of the midbrain.

Age Group: Diffuse midline gliomas can affect both children and adults, but they are more commonly seen in children and young adolescents. They are a major cause of brain tumors in pediatric patients.

Types: The most common type of diffuse midline glioma in children is called “diffuse intrinsic pontine glioma” (DIPG), which specifically affects the pons. In adults, these tumors may be referred to as midline gliomas or thalamic gliomas, depending on their location.

Aggressiveness: These tumors are highly aggressive and invasive, often infiltrating surrounding brain tissue. Due to their location in critical areas of the brain, surgical removal is usually not feasible, and they tend to have a poor prognosis.

Symptoms: Symptoms of diffuse midline gliomas can vary depending on their location but often include neurological symptoms such as weakness, difficulty swallowing, speech problems, and coordination issues. In the case of DIPG, it can lead to severe brainstem dysfunction.

Diagnosis: Diagnosis is typically made through imaging studies, such as MRI scans, which show the presence and location of the tumor. A biopsy is usually not performed due to the high risk associated with sampling these tumors in sensitive brain regions.

Treatment: Treatment options for diffuse midline gliomas are limited due to their location and aggressiveness. Radiation therapy is often used to alleviate symptoms and slow tumor growth.

Chemotherapy may also be considered, but it tends to have limited effectiveness.

Prognosis: Unfortunately, diffuse midline gliomas, including DIPG, have a very poor prognosis. Most patients have a short life expectancy after diagnosis, with survival measured in months rather than years. Advances in treatment options are being researched, but progress has been slow.

Clinical Trials: Some patients may be eligible for clinical trials exploring experimental treatments or therapies aimed at targeting specific molecular features of the tumor. Participation in clinical trials may offer some hope for improved outcomes.

In summary, diffuse midline gliomas are aggressive brain tumors that primarily affect the midline structures of the brain, and they are associated with a grim prognosis. Treatment options are limited, and research into new therapies is ongoing to improve outcomes for affected individuals.

Classification

Here are the main subtypes of diffuse midline gliomas based on molecular characteristics:

Diffuse midline glioma H3 K27-altered.

Diffuse Midline Glioma, H3 G34-mutant: In addition to the H3 K27M mutation, a subset of diffuse midline gliomas may harbor mutations affecting the glycine 34 (G34) residue of histone H3 proteins (H3F3A or HIST1H3B). These tumors typically arise in the cerebral hemispheres and have distinct molecular and clinical features compared to H3 K27M-mutant gliomas.

Diffuse Midline Glioma, Not Otherwise Specified (NOS): This category includes diffuse midline gliomas that do not harbor mutations in genes encoding histone H3 proteins or other defining molecular alterations. These tumors may exhibit other genetic abnormalities or molecular features that distinguish them from other glioma subtypes.

Diffuse Astrocytic Glioma, H3 G34-mutant, IDH-wildtype: This subtype includes diffuse gliomas with H3 G34 mutations but lacking mutations in the isocitrate dehydrogenase (IDH) genes. These tumors typically occur in children and young adults and have a distinct molecular profile compared to other diffuse gliomas.

It's important to note that these classifications are based on molecular features and are essential for guiding treatment decisions and predicting prognosis in patients with diffuse midline gliomas. Additionally, ongoing research may lead to further refinement of these classifications and identification of additional molecular subtypes.

MRI

In the medial portion of the left temporal lobe, a tumor-like lesion measuring 4.6 x 4.9 x 3.8 cm (AP x TR x CC) is identified. It is located intra-axially, hypointense on T1, and predominantly hyperintense on T2 with infiltrative characteristics. It enhances significantly after the administration of contrast and

shows small focal areas of diffusion restriction. This lesion extends anteriorly into the sellar region, causing dilation of the suprasellar cistern and compression of the hypothalamus, infundibulum, the pituitary fossa, and the optic chiasm. Caudally, it extends into the brainstem with infiltration of both globus pallidus, the posterior limb of both internal capsules, and the ipsilateral thalamus, partially occupying the left ambient cistern, and diffusely infiltrating the midbrain.

There is associated moderate vasogenic edema with mass effect on the left lateral ventricle, partial obliteration of the same, and mass effect on the left cerebral peduncle, resulting in rightward displacement of the midbrain with nearly complete collapse of the third ventricle and partial collapse of the right ambient cistern.

Conclusion: The study reveals findings compatible with a primary brain neoplasm, and the imaging characteristics raise the differential diagnosis of pilocytic astrocytoma involving the optic chiasm-hypothalamus versus diffuse midline glioma.