

# Glioblastoma: Overview of Disease and Treatment

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## Key points:

- Introduction
- Classification of glioblastoma
- Diagnosis
- Treatment process
- Causes of glioblastoma
- Signs and symptoms of glioblastoma
- Vaccine platforms

## Introduction

Glioblastoma also referred as GBM, is the most aggressive and prevalent primary malignant brain tumor in adults. GBM presents a significant clinical challenge as it is characterized by rapid growth, extensive infiltration and resistance to conventional therapies. This research explores the impact of tumor microenvironment, immune invasion mechanism in improving GBM treatment.<sup>1</sup>

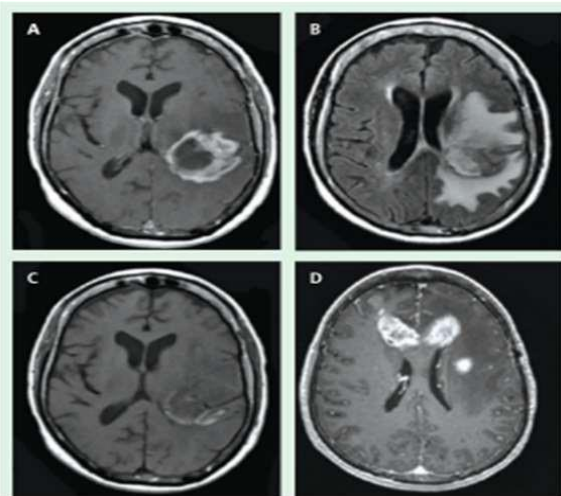


Figure 1: Radiographic Features of Glioblastoma on Magnetic Resonance Imaging.<sup>2</sup>

## Classification of Glioblastoma

The fourth WHO classification of gliomas from 2016 is based on the degree of malignancy, as determined by histopathological criteria, in which four types of astrocytomas have been distinguished:

1. Non-Infiltrating (Grade 1) Astrocytomas: These do not usually spread into nearby tissues and can be more easily removed surgically. Patients with these tumors often have a good prognosis. These tumors are more common in children than in adults.
2. Low-Grade (Grade 2) Astrocytomas: These can grow slowly into nearby areas and can become more aggressive over time.
3. Anaplastic (Grade 3) Astrocytomas: These grow more quickly and can turn into glioblastomas.
4. Glioblastomas (Grade 4): This is the stage at which these tumors grow fastest. They are the most common malignant brain tumors in adults.<sup>3</sup>

## Diagnosis

1. Magnetic Resonance Imaging (MRI):

The gold standard, with contrast-enhanced MRI revealing a ring-enhancing lesion with central necrosis. It also gives insight into tumor metabolism and cellular architecture.

### 2. Positron Emission Tomography:

Assist in differentiating tumor progression from radiation necrosis, especially when combined with novel tracers such as fluorodeoxyglucose (FDG).

### 3. Magnetic Resonance Imaging (MRI):

The gold standard, with contrast-enhanced MRI revealing a ring-enhancing lesion with central necrosis. It also gives insight into tumor metabolism and cellular architecture.

## Treatment Processes

Glioblastoma, classified as a grade IV astrocytoma by the World Health Organization, accounts for approximately 48% of all malignant primary brain tumors. With a median survival of 12 to 15 months post-diagnosis, GBM remains a formidable challenge in neuro-oncology. GBM treatment approaches are as follows:

1. Surgical resection
2. Radiotherapy
3. Chemotherapy
4. Tumor testing fields (TT Fields)
5. Immunotherapy
6. Gene therapy

and many other processes that helps to improve the cure of challenges faced during the treatment of GBM<sup>3</sup>.

## Causes of Glioblastoma

Although the precise cause of glioblastoma hasn't been clearly defined, researchers have identified a list of characteristics shared by many patients with this form of brain cancer. These characteristics are known as risk factors. While risk factors can help determine a person's likelihood of developing glioblastoma, it's important to remember that:

1. Risk factors do not necessarily cause cancer to develop
2. Many people who have one or more glioblastoma risk factors never develop cancer
3. Some people develop glioblastoma without having any of the known risk factors

## Signs and symptoms of Glioblastoma

Symptoms can include headache, memory loss, weakness on one side of the body, difficulty speaking and thinking, drowsiness, nausea, vomiting, and seizures.

Symptoms of glioblastoma can also include the following:

1. Doubled or blurred vision
2. Loss of appetite
3. Change in mood or personality

## Vaccine Platforms

The general element in a vaccine design includes an antigen, a danger signal and a vehicle to transport the antigen. There are four vaccine platforms which incorporate these elements and are applied in clinical trials in vaccines for GBM: peptide vaccines, dendritic cell vaccines, mRNA vaccines, and vector vaccines.

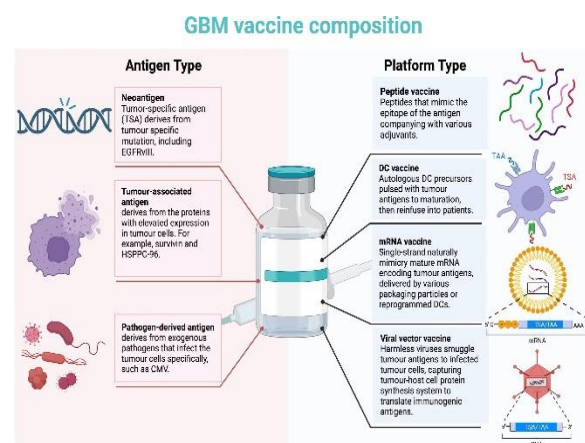


Figure 2: GBM Vaccine Composition.<sup>4</sup>

## Conclusion

Glioblastoma remains one of the most difficult cancers to treat, with limited therapeutic success. While current treatment modalities provide modest survival benefits, ongoing research into immunotherapy, gene therapy, and targeted therapies offers hope for future breakthroughs. The integration of liquid biopsy technologies, and Nano medicine could revolutionize GBM management in the coming years.<sup>4</sup>

## References

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