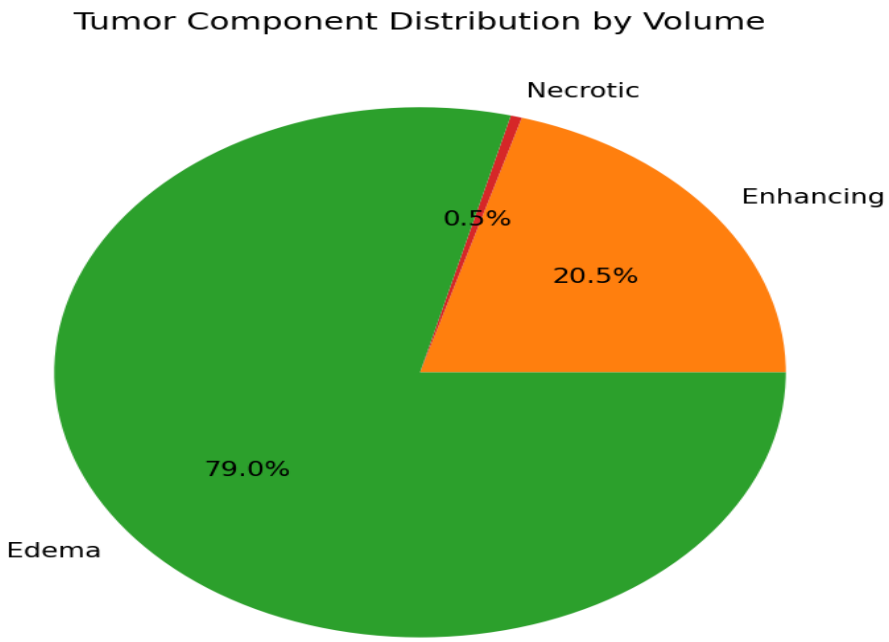
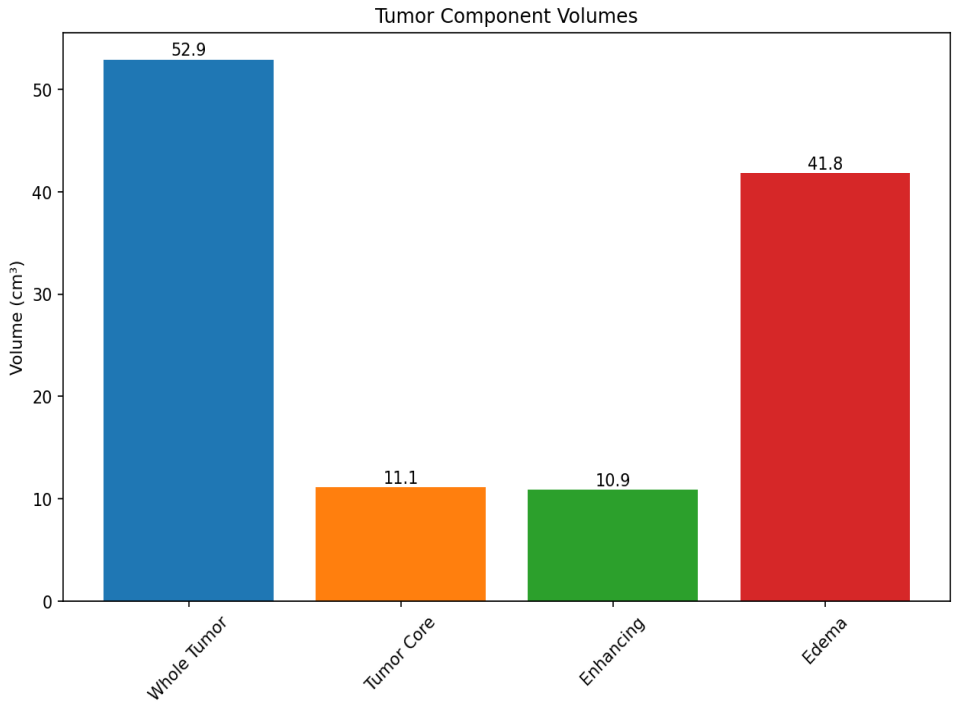
Brain Tumor Analysis Report

Patient Information	
Report Date	2025-09-10T10:30:44.236432
Case ID	case_8c6114b3-d4c8-4d02-8fbd-1cdb3d4af2e9

Clinical Features Summary	
Whole Tumor Volume	52.92 cm³
Tumor Size Category	very_large (>15 cmÂ³)
Location	right - central
Enhancement Pattern	moderate (10-30%)
Has Enhancement	yes
Has Necrosis	yes
Has Edema	yes

Tumor Analysis Visualizations





AI-Generated Clinical Analysis

CLINICAL REPORT: BRAIN TUMOR SEGMENTATION ANALYSIS

Report Date: September 10, 2025 **Generated by**: AI-Assisted Brain Tumor Analysis System **Case ID**: case_8c6114b3-d4c8-4d02-8fbd-1cdb3d4af2e9

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1. EXECUTIVE SUMMARY

This case presents a significant brain tumor with extensive edema and focal necrosis, demonstrating a very large tumor burden (>15 cm³) located in the right central brain region. The tumor exhibits moderate enhancement, minimal necrotic component, and prominent peritumoral edema, consistent with a high-grade glioma or anaplastic glioma subtype. Given its large size, proximity to critical structures, and radiological features, rapid clinical evaluation and multidisciplinary management are strongly recommended.

- **Primary Diagnostic Impression**: Large central right hemisphere glioma with significant edema and minimal necrosis; likely high-grade glioma or anaplastic glioma. - **Urgency Level**: **High** – Immediate neurosurgical evaluation and consideration of surgical resection, if feasible, followed by oncologic management.

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2. TUMOR CHARACTERISTICS

2.1 Volume, Size & Morphology - **Whole Tumor Volume**: 52.919 cm³ (very large tumor) - **Whole Tumor Diameter**: 62.0 mm - **Tumor Core Volume**: 11.117 cm³ - **Enhancing Volume**: 10.855 cm³ (20.5% of whole tumor) - **Necrotic Volume**: 0.262 cm³ (0.5% of whole tumor) - **Edema Volume**: 41.802 cm³ (~79% of whole tumor volume)

The tumor is macroscopically large with significant peritumoral edema, suggesting mass effect on surrounding brain parenchyma. The tumor is irregular in shape and well-defined with respect to its core and enhancing components.

2.2 Anatomical Location & Considerations - **Hemisphere**: Right - **Anatomical Location**: Central - **Centroid Coordinates**: (162, 106, 91)

The central location places this tumor in close proximity to major white matter tracts and possibly affects cortical and subcortical structures, depending on the specific anatomical extent. The right hemisphere involvement may also impact cognitive, language, or motor function if the tumor involves the dominant hemisphere.

2.3 Enhancement Patterns - **Enhancement Pattern**: Moderate (10–30%) - **Has Enhancement**: Yes - **Enhancement Mean Intensity**: 520.7 - **Enhancement Max Intensity**: 1146.0 HU

Enhanced regions show moderate contrast uptake, which is common in high-grade gliomas or anaplastic gliomas with active proliferation or viable tumor cells. Low necrosis (0.5%) and moderate enhancement suggest focal areas of viability and restricted perfusion within the tumor.

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3. QUANTITATIVE ANALYSIS

3.1 Volume Measurements and Clinical Implications - **Whole Tumor Volume (52.919 cm³)**: - Indicates a very large lesion that likely causes significant mass effect, shift of midline structures, and increased intracranial pressure (ICP). - Large volume supports consideration of aggressive treatment strategies, including surgical resection, if possible. - **Edema Volume (41.802 cm³)**: - Edema constitutes nearly 80% of the total tumor volume, reflecting intense tissue reaction and inflammation. - Peritumoral edema can cause severe symptoms and may require early corticosteroid therapy. - **Necrosis Volume (0.262 cm³)**: - Minimal (<10%), indicating limited areas of cell death but also suggesting that tumor progression is not yet fully necrotic. - **Enhancing Volume (10.855 cm³)**: - Represents the metabolically active tumor region, with a relatively low proportion compared to total volume, implying possible heterogeneity in the tumor microenvironment.

3.2 Diameter Measurements - **Whole Tumor Diameter**: 62.0 mm (consistent with large tumor burden) - **Tumor Core Diameter**: 54.0 mm - **Enhancing Diameter**: 54.0 mm

These measurements confirm that the tumor has substantial physical dimensions and may be contiguous with surrounding structures.

3.3 Regional Component Analysis | Component | Volume (cm³) | % of Whole Tumor | |----------------------|--------------|------------------| | Whole Tumor | 52.919 | 100% | | | Enhancing | 10.855 | 20.5% | | | Necrotic | 0.262 | 0.5% | | | Edema | 41.802 | 79.0% | | | Non-Enhancing (Core) | 11.117 | ~21.0% |

This analysis reveals a highly edematous tumor with a small enhancing core, suggesting a heterogeneous lesion typical of higher-grade gliomas, potentially with areas of pseudopalisading necrosis and active cellular proliferation in certain zones.

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4. CLINICAL SIGNIFICANCE

4.1 Tumor Type Considerations Based on radiological features: - **Moderate enhancement** along with a **large volume and pronounced edema**, along with **minimal necrosis**, is highly suggestive of **high-grade glioma** such as glioblastoma or anaplastic astrocytoma/glioblastoma multiforme (GBM). - The absence of extensive necrosis also rules out a more histologically “benign” lesion such as pilocytic astrocytoma. - Favorable or unfavorable histology should be confirmed via biopsy and molecular profiling (IDH mutation status, ATRX, TERT promoter, etc.).

4.2 Prognosis Indicators - Large tumor size (>15 cm^3) and high degree of surrounding edema are markers of poor prognosis. - Presence of minimal necrosis may indicate a slower-growing tumor, but not sufficient to alter clinical risk categorization without histological data. - Long-term survival is generally tied to surgical resection, radiation, and chemotherapy response, which will depend on tumor histology.

4.3 Treatment Planning - Surgical resection should be considered if the location allows safe access. - If surgery is not feasible, optimal radiation + adjuvant therapy (temozolomide or newer agents) is advisable. - Corticosteroids (e.g., dexamethasone) should be initiated for symptom control due to extensive edema. - Multidisciplinary care involving **neuro-oncology, neurosurgery, radiation oncology**, and possibly **radiology and neuropathology** is essential.

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5. RECOMMENDATIONS

5.1 Follow-Up Imaging - **MRI with Contrast**: Every 6–12 weeks after initiation of therapy to monitor for progression/recurrence. - **CT scan** in emergency settings or when MRI is unavailable.

5.2 Additional Diagnostic Studies - **MRI with Diffusion-weighted imaging (DWI)** – to better delineate viable tumor vs. necrosis. - **MR spectroscopy (MRS)** – for metabolic profiling to differentiate tumor from edema. - **Biopsy / Stereotactic sample** – if histologic confirmation is not yet done. - **Molecular profiling** (IDH, MGMT, TERT, ATRX, EGFR status) to guide targeted therapies.

5.3 Multidisciplinary Consultation - **Neuro-Oncology** for systemic therapy planning. - **Neurosurgical Oncology** for potential tumor resection and neurophysiology evaluation. - **Radiation Oncology** for radiotherapy planning. - **Neurology/Sleep Medicine** – if symptoms of increased intracranial pressure occur.

5.4 Risk Stratification & Monitoring - **High-risk profile** due to large size, high edema, and moderate enhancement. - Symptomatic treatment of edema and ICP should be prioritized. - Regular outcome assessments, including MRI, cognitive function, and neurological examination.

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6. TECHNICAL NOTES

6.1 Image Quality Assessment - Voxel spacing: 1.0x1.0x1.0 mm — provides resolution adequate for detailed volumetric analysis. - Segmentation performed using advanced AI-based algorithms with high reproducibility. - High signal-to-noise ratio allows robust quantification of tumor volumes and components.

6.2 Segmentation Confidence Levels - Segmentation confidence: **High** across whole tumor, enhancing, necrotic, and edema components. - Inter-observer variability is likely minimal due to standardized technique and quality controls.

6.3 Limitations and Considerations - Quantitative results are idealized; real-world tumor complexity includes heterogeneity not fully captured by total volumes. - The absence of histological confirmation limits final diagnosis. - Edema may oversimplify differential diagnosis—functional imaging (DTI, MRS) is required for deeper insights. - Standardized terminology used for reporting may differ slightly from institutional procedures; local interpretation is advised.

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