



# NEURORADIOLOGY CASE

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# History

- 65 y.o. F
- Vision changes
- Difficulty with word finding
- Slurring of speech
  
- Physical exam
  - Right homonymous hemianopsia
  - Right-sided facial droop
  - Right sided pronator drift
  - Satelliting around right extremity

*What imaging should we order?*

# ACR Appropriateness Criteria

**Variant 3:** New focal neurologic defect, fixed or worsening. Less than 6 hours. Suspected stroke.

Radiologic Procedure	Rating	Comments	RRL*
CT head without IV contrast	9	Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.	☼☼☼
MRI head without IV contrast	8	Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Can be useful if there is a contraindication to contrast. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.	○
MRI head without and with IV contrast	8	Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI head with contrast can be helpful to determine the age of infarct and to evaluate for other causes of symptoms such as tumor or infection.	○
MRA head and neck without IV contrast	8	Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA. Can be useful in patients with renal failure or contrast allergies.	○
MRA head and neck without and with IV contrast	8	Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA.	○
CTA head and neck with IV contrast	8	CTA can be obtained after NCCT.	☼☼☼
CT head perfusion with IV contrast	6		☼☼☼
MRI head perfusion with IV contrast	5		○
Arteriography cervicocerebral	5		☼☼☼
CT head with IV contrast	3		☼☼☼
CT head without and with IV contrast	3		☼☼☼
US duplex Doppler carotid	2		○

**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

\*Relative Radiation Level

**Variant 4:** New focal neurologic defect, fixed or worsening. Longer than 6 hours. Suspected stroke.

Radiologic Procedure	Rating	Comments	RRL*
MRI head without IV contrast	8	Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. Can be useful if there is a contraindication to contrast. MRI is more sensitive than CT for acute infarct.	○
MRI head without and with IV contrast	8	Parenchymal brain imaging and CT or MR vascular imaging of the head and neck should be considered. Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.	○
MRA head and neck without IV contrast	8	Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA. May be useful in patients with renal failure or contrast allergies.	○
MRA head and neck without and with IV contrast	8	Can be obtained in conjunction with MRI head. Preferred MR vascular imaging of the head and neck includes noncontrast head MRA and contrast-enhanced neck MRA.	○
CT head without IV contrast	8	Noncontrast head CT is often obtained first to assess for hemorrhage or large infarct. MRI is more sensitive than CT for acute infarct.	☼☼☼
CTA head and neck with IV contrast	8	CTA can be obtained after NCCT.	☼☼☼
Arteriography cervicocerebral	6		☼☼☼
CT head perfusion with IV contrast	5		☼☼☼
MRI head perfusion with IV contrast	5		○
CT head with IV contrast	3		☼☼☼
CT head without and with IV contrast	3		☼☼☼
US duplex Doppler carotid	2		○

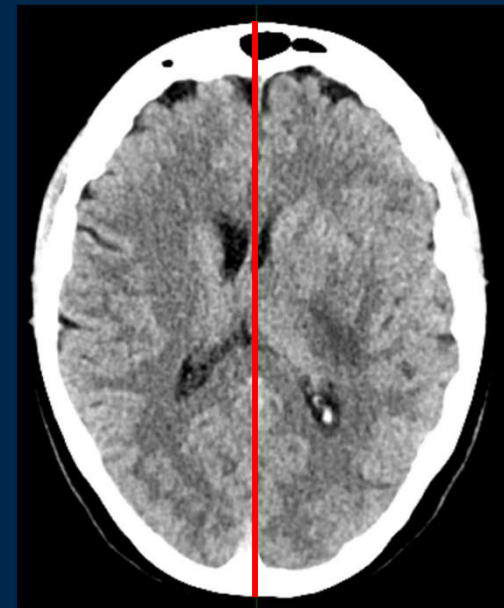
**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

\*Relative Radiation Level

<http://acsearch.acr.org/list>



# Non-con CT Head



# Findings

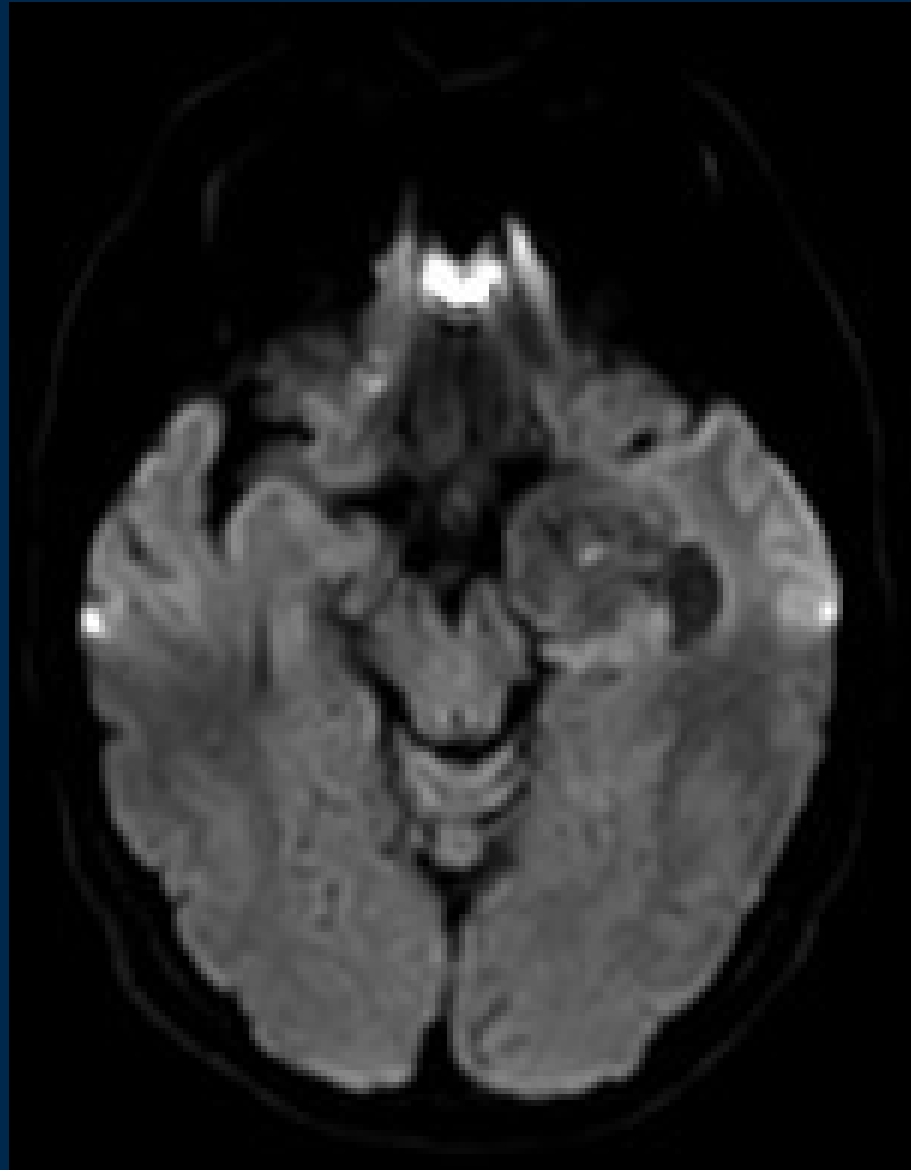
- No acute intracranial hemorrhage
- Likely mass in left basal ganglia with potential involvement of the temporal and frontal lobes
- Some mass effect causing left lateral ventricle effacement and rightward midline shift

# Differential Diagnosis

- Glioblastoma
- Metastasis
- Other brain tumors (less likely):
  - Oligodendroglioma
  - Ependymoma
  
- In right clinical context
  - Abscess

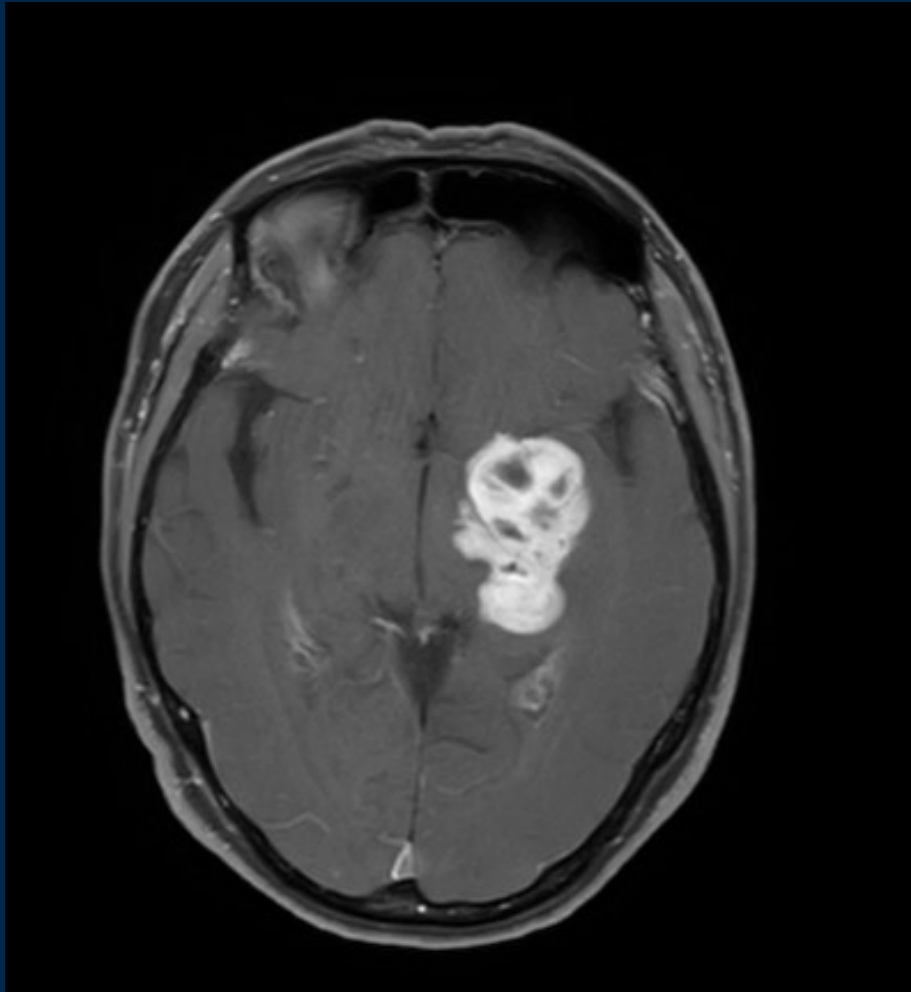
*What imaging now?*

# MR Brain

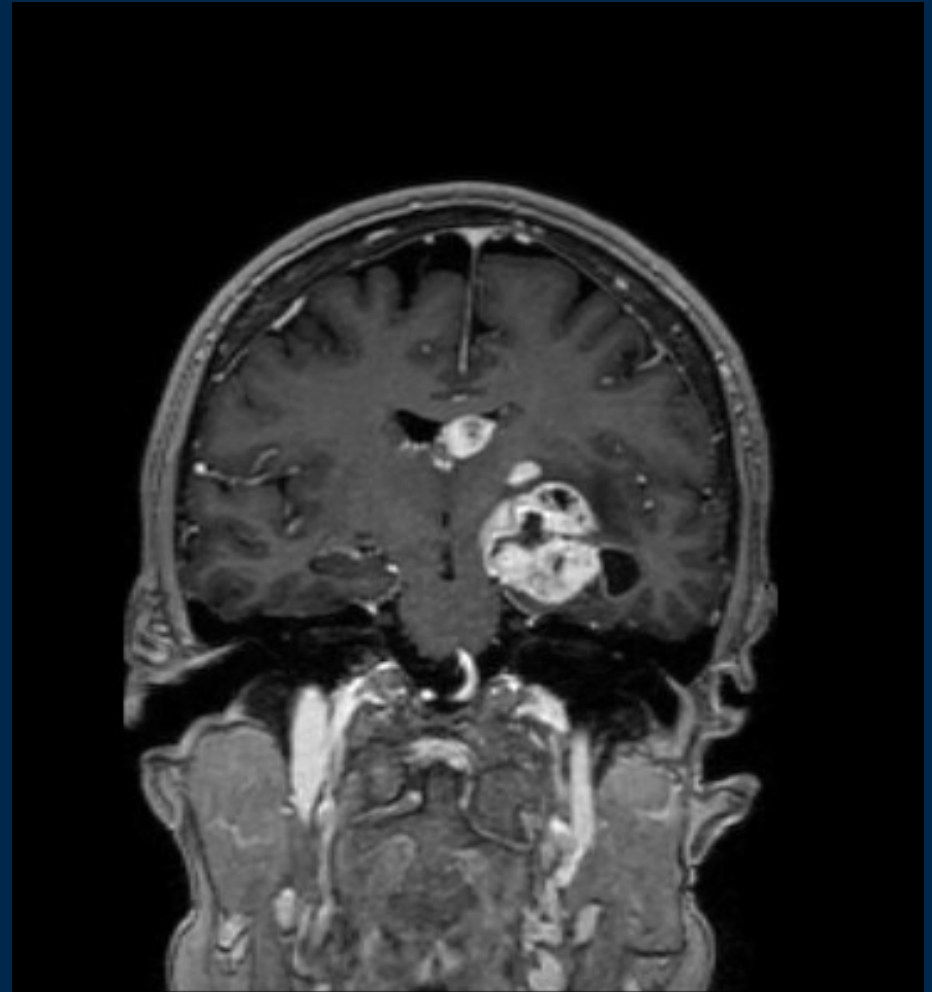


*DWI*

# MR Brain cont...



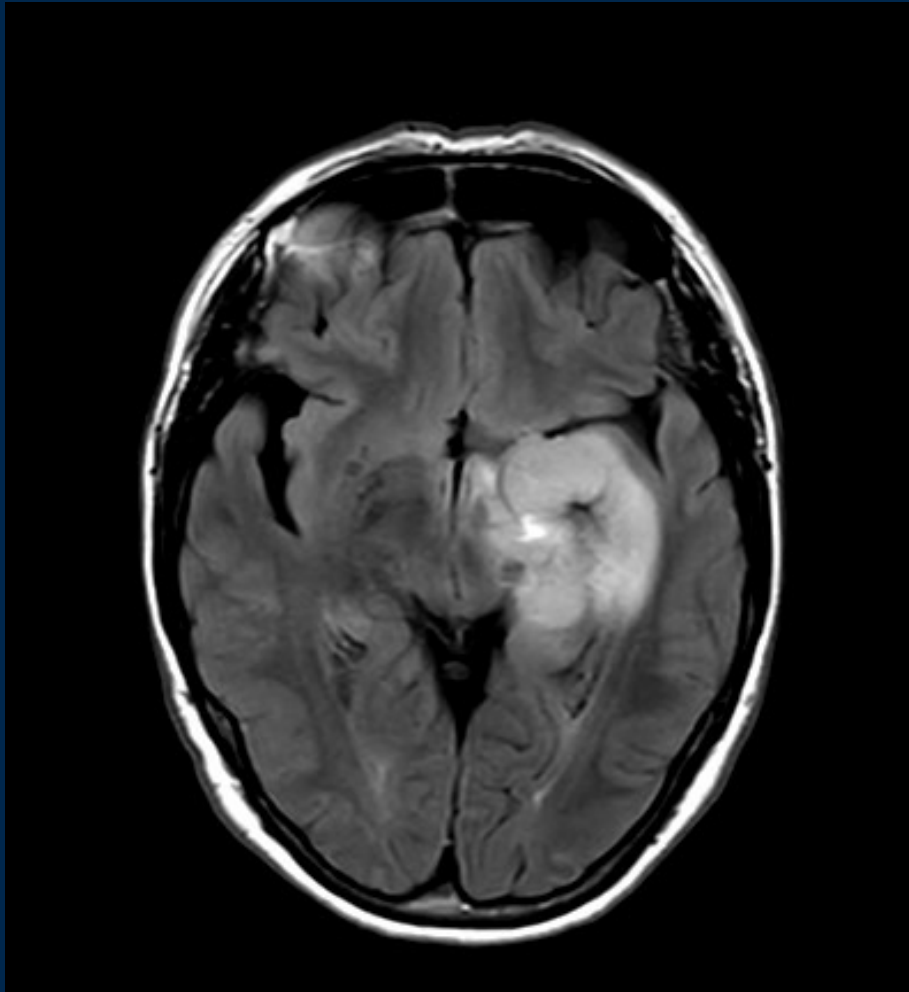
*Post-contrast T1*



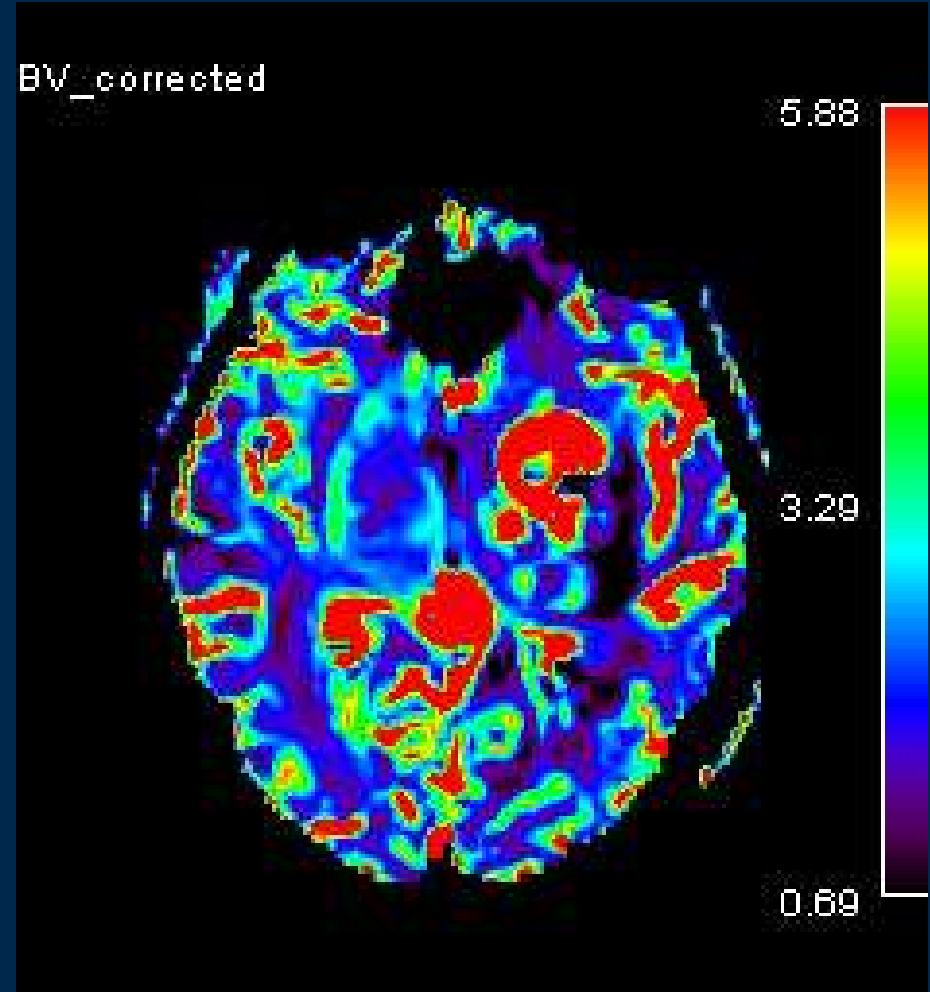
*Coronal reformatted post-contrast T1*



# MR Brain cont...



*T2 FLAIR*



*Perfusion*

# Findings

- 4.7 x 3.8 x 4 cm mass in left basal ganglia and temporal lobe
  - Heterogeneously enhancing
  - Lobulated with necrotic centers
  - Left lateral ventricle effacement and rightward midline shift

# Diagnosis and Management

- Pathology: WHO grade IV GBM
- Patient's case discussed at Tumor Board
  - Unresectable
  - Options
    - Supportive measures
    - Combination of radiation therapy and chemotherapy

# Glioblastoma

- Most common primary brain tumor in adults
- Annual incidence: 3 per 100,000 persons in U.S.
- Types (determined by genetic testing)
  - Primary/de novo
  - Secondary
- Median age at diagnosis: 62 years
- Median survival: 10-15 months
- MR brain: ring enhancing mass with necrotic center(s) on post-contrast T1 weighted image
- Tx: maximal safe tumor resection, radiation therapy, chemotherapy based on tumor and patient status

# Role of Imaging

- Non-contrast CT an integral part of stroke protocol for ruling out hemorrhagic stroke
- Brain MR is the gold standard for detecting and classifying brain tumors

# Cost

	Charge	Discounted Charge
Non-contrast CT Head	\$ 2,134	\$ 854
MR Brain w/wo contrast	\$ 6,593	\$ 2,637

<https://www.uofmhealth.org/MyChart-PRD/Estimates/GetEstimateDetails>



## Take Home Points

1. Teasing out the chronicity of symptoms of patients can help aid diagnosis
2. Ischemic infarct should show up hyperintense on DWI with corresponding low signal on ADC MRI
3. MR Brain w/wo contrast is vital in helping to classify brain tumors
4. The most common brain tumors are metastases from other parts of the body. Of primary brain tumors, GBM is most common

# References

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3. DynaMed [Internet]. Ipswich (MA): EBSCO Information Services. 1995 - . Record No. T116043, *Glioblastoma*; [updated 2018 Dec 03, 2021 Feb 24]. Available from <https://www.dynamed.com/topics/dmp~AN~T116043>. Registration and login required.
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6. Davis ME. Glioblastoma: Overview of Disease and Treatment. *Clin J Oncol Nurs*. 2016 Oct 1;20(5 Suppl):S2-8. doi: 10.1188/16.CJON.S1.2-8. PMID: 27668386; PMCID: PMC5123811.