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NEURORADIOLOGY
DIL part 5

Masses and tumors

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OVERVIEW

- Introduction to Neuroimaging - DIL part 1
- Basic Brain Anatomy - DIL part 1
- Standardized Approach to Image Interpretation - DIL part 2
- **Common Pathology**
  - Bleeds (Hemorrhages) - DIL part 3
  - Strokes (Infarcts) DIL part 4
  - **Masses (Tumors) part 5**

MASSES

- This is a complex topic, that we will try to keep relatively simple.
- Let's go through some of the key things to assess when looking at an intracranial mass.

MASSES

- Analysis:
  - Patient age
  - Localization
    - Intra or extra-axial
    - Specific compartment
  - Specific mass characteristics (eg. fat, Ca2+)
  - Enhancement
  - Mass effect and edema
  - Solitary vs Multiple
  - Mimics

MASSES

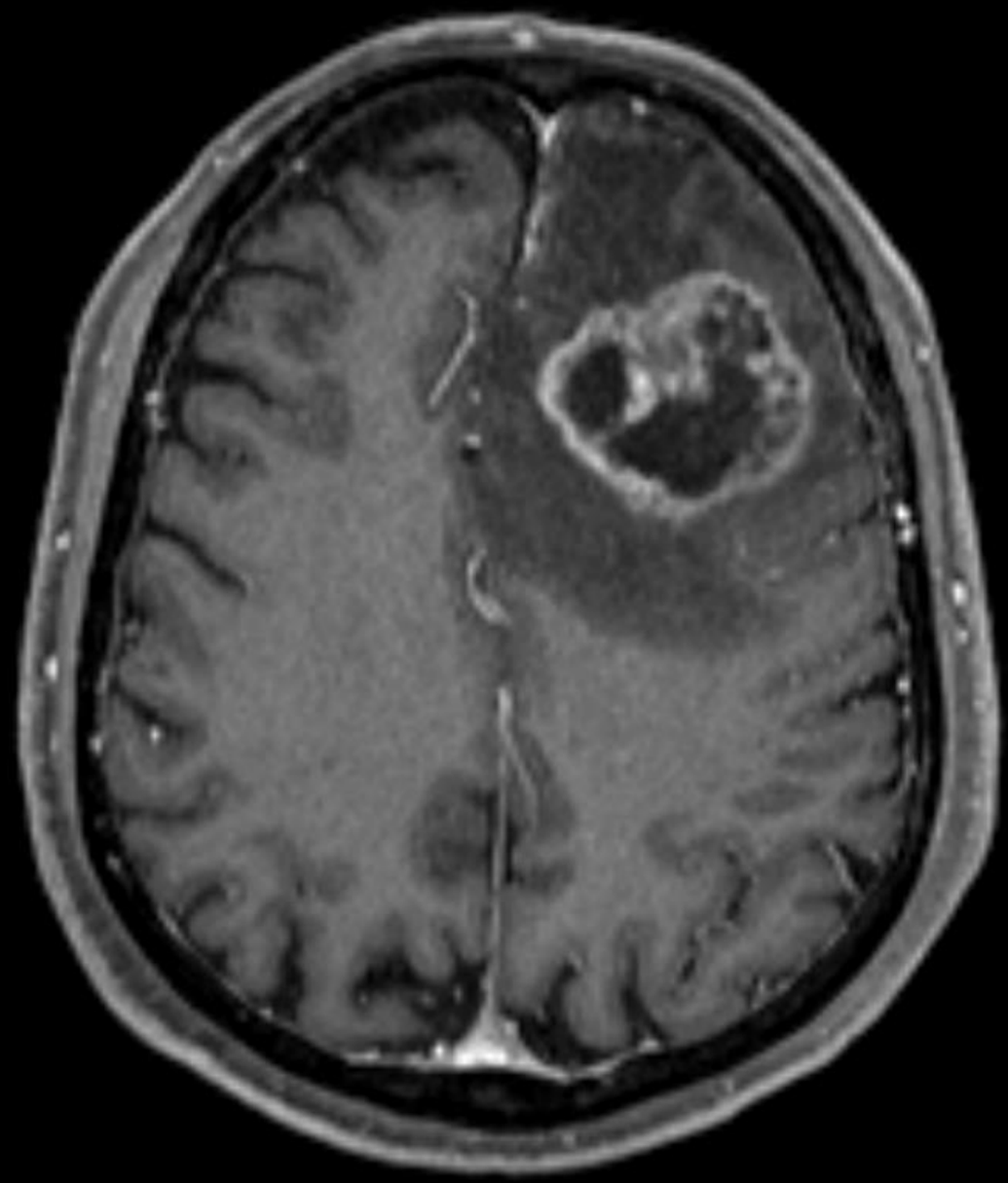
- Age:
  - In children, most brain tumors are infratentorial (in the posterior fossa, below the tentorium cerebellum)
    - eg. astrocytoma, medulloblastoma, ependymoma
  - In adults, most brain tumors are supratentorial
    - eg. metastasis, glioma, meningioma

MASSES

- Location:
  - One of the most important features to determine is "intra" vs "extra-axial" location.
  - You now know what this means. To recap:
    - Intra-axial = inside the skull and INSIDE the brain parenchyma.
    - Extra-axial = inside the skull and OUTSIDE the brain parenchyma.

MASSES

- Intra-axial
  - Inside the skull AND inside the brain parenchyma
  - Grey matter can be seen surrounding the mass

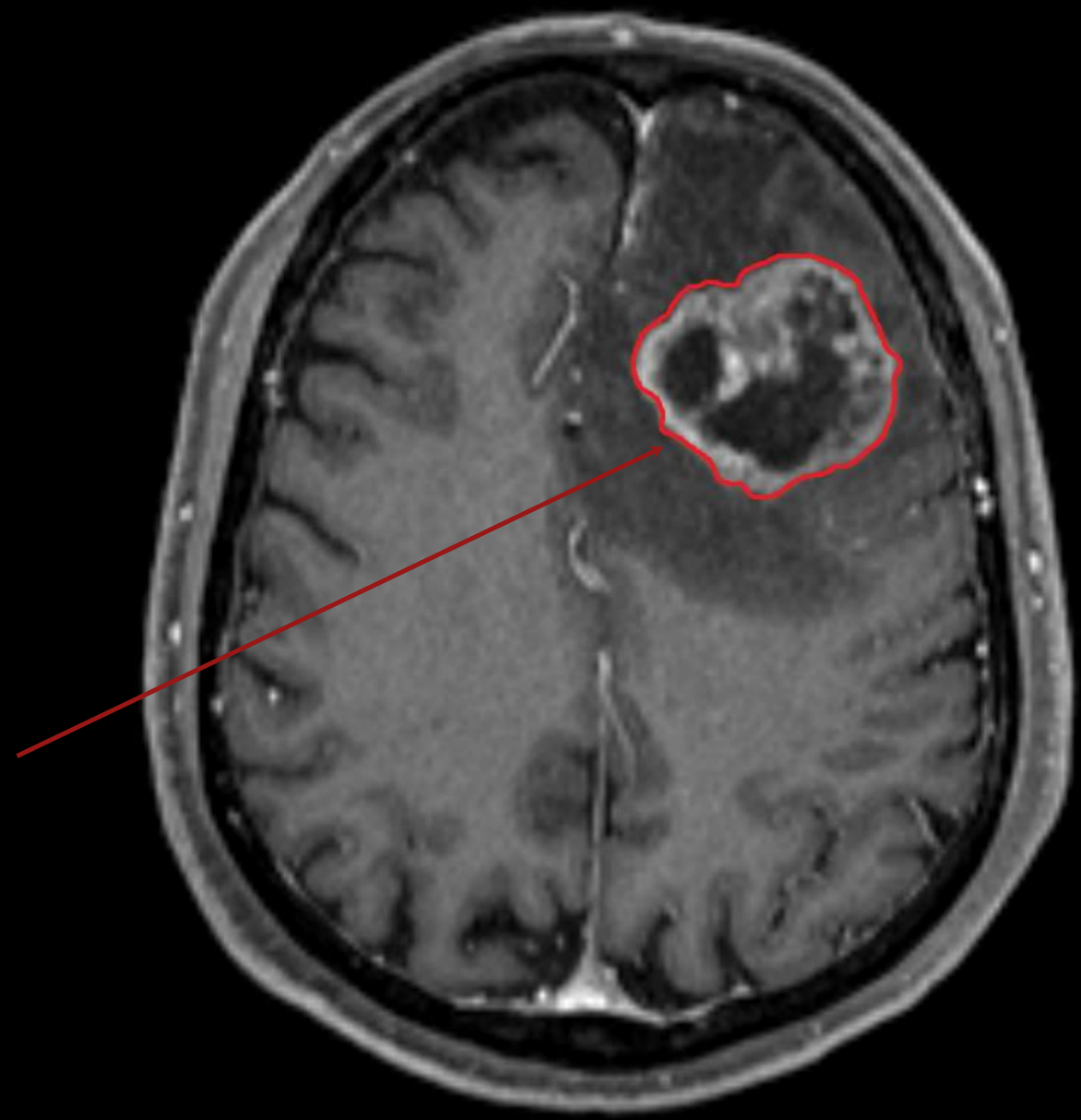


Axial

MASSES

- Intra-axial
  - Inside the skull AND inside the brain parenchyma
  - Grey matter can be seen surrounding the mass

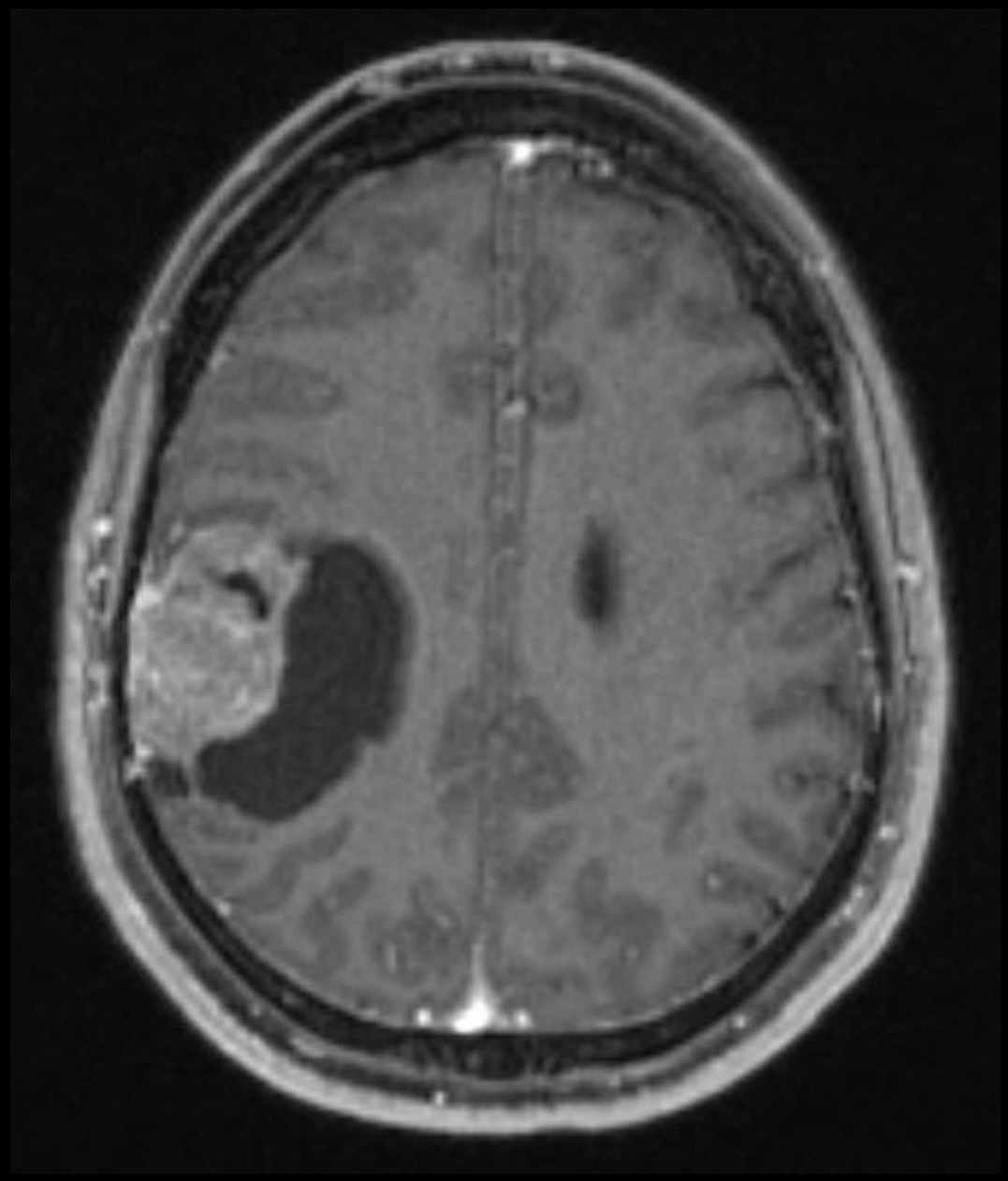
This is a contrast enhanced MRI (T1 axial post gadolinium). It shows a large mass in the left frontal lobe.



Axial

MASSES

- Extra-axial
  - Inside the skull BUT outside of the brain parenchyma
  - Notice how the mass directly abuts the skull. There is no grey matter overlying the mass.

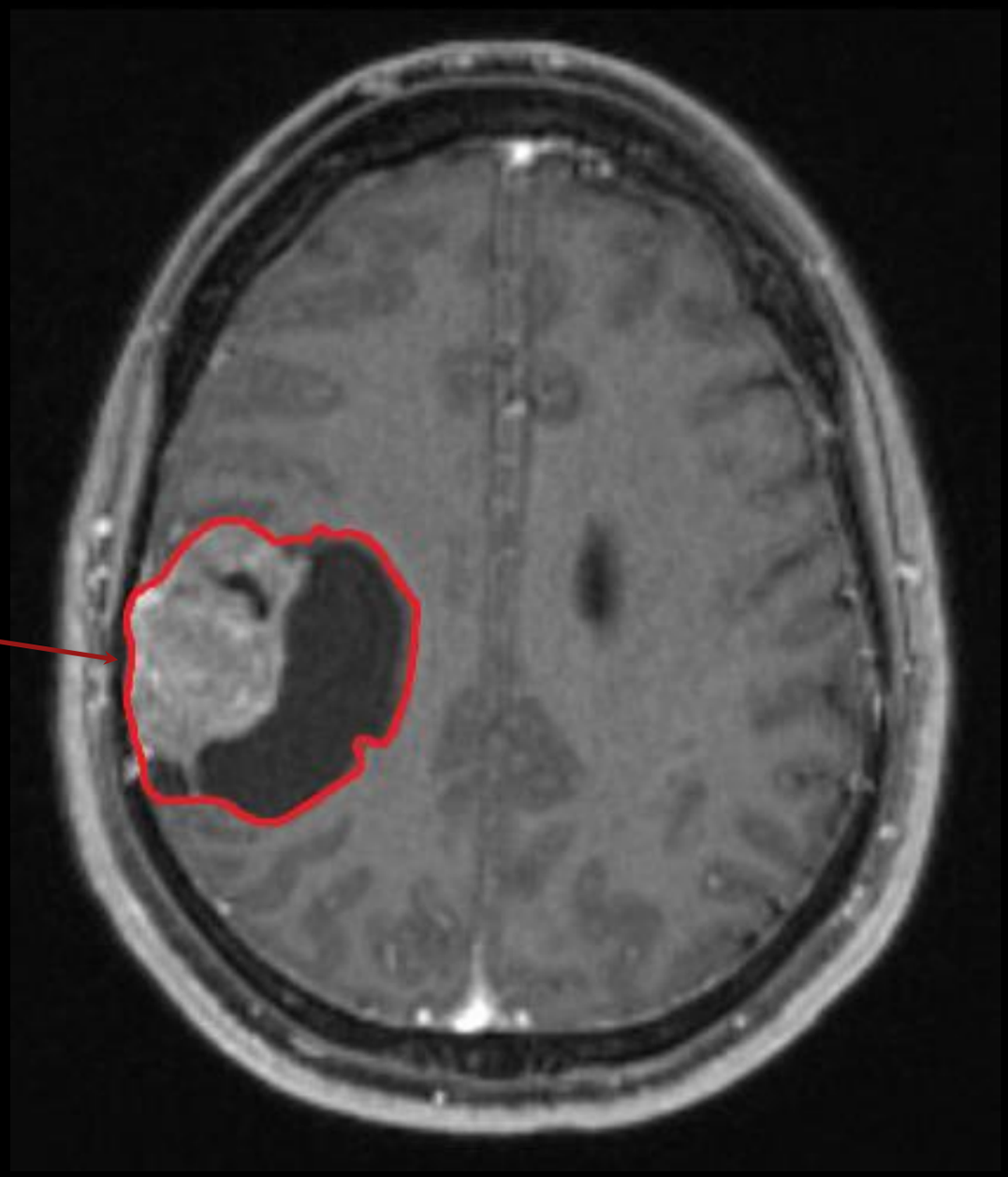


Axial

MASSES

- Extra-axial
  - Inside the skull BUT outside of the brain parenchyma
  - Notice how the mass directly abuts the skull. There is no grey matter overlying the mass.

There are many different extra-axial masses. The most common is a meningioma.



Axial

MASSES

- It's not always that easy to differentiate an intra-axial mass from an extra-axial mass.
- However, it is very helpful to distinguish the two, as the types of masses that can be found in each space are very different.
- There are specific features to look for to suggest an extra-axial location, but those features are beyond the scope of this module.

MASSES

- Specific characteristics of the mass are helpful
  - Is it hyperdense? Is it isodense? Is it cystic (fluid density)?
  - Does it contain calcifications?
  - Does it contain fat?
  - ...etc.
- We won't get into how these change the differentials, just know that specific features of the mass itself are important.

MASSES

- Enhancement
  - In a normal healthy subject, the brain has an intact blood-brain-barrier (BBB).
  - When there is damage to the BBB (eg. from certain tumors, among other causes), IV contrast can pass the BBB and cause enhancement of the mass.
  - Note locations where there is no BBB
    - pituitary gland, pineal gland, choroid plexus, and extra-axial structures.
    - These will enhance in normal states - don't get fooled!

MASSES

- Enhancement
  - The specific type of enhancement is important.
    - Does the mass enhance homogeneously or heterogeneously?
    - A common type of enhancement to be aware of is peripheral rim enhancement.
      - This has a nice differential you may know...

MASSES

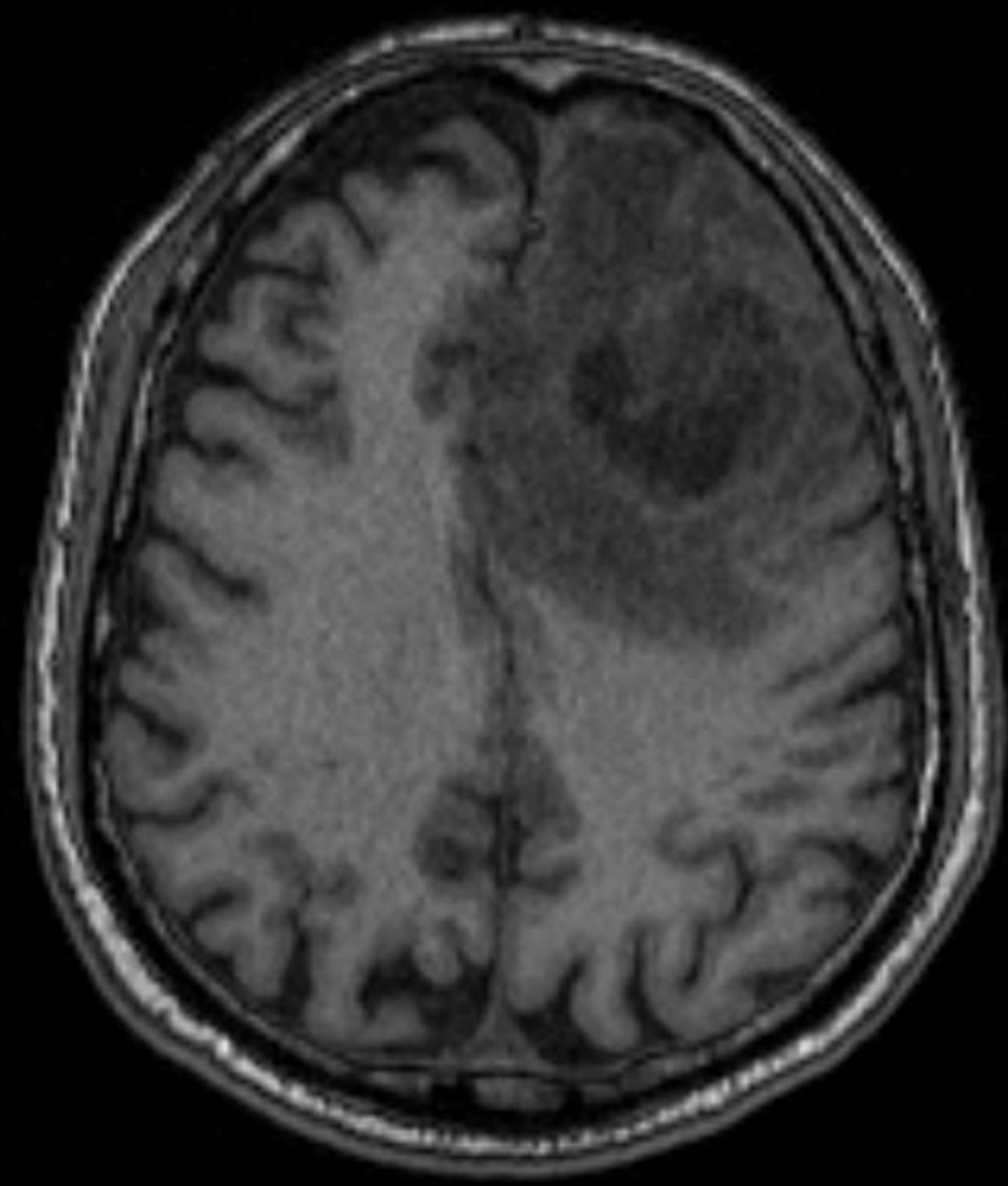
- Enhancement
  - Peripheral Rim Enhancement Differential:
    - Metastases
    - Abscess
    - GBM (glioblastoma multiforme), a high grade glial neoplasm

MASSES

- Here is a case you've already seen.

- This is a T1 sequence MRI. There is no contrast given yet.

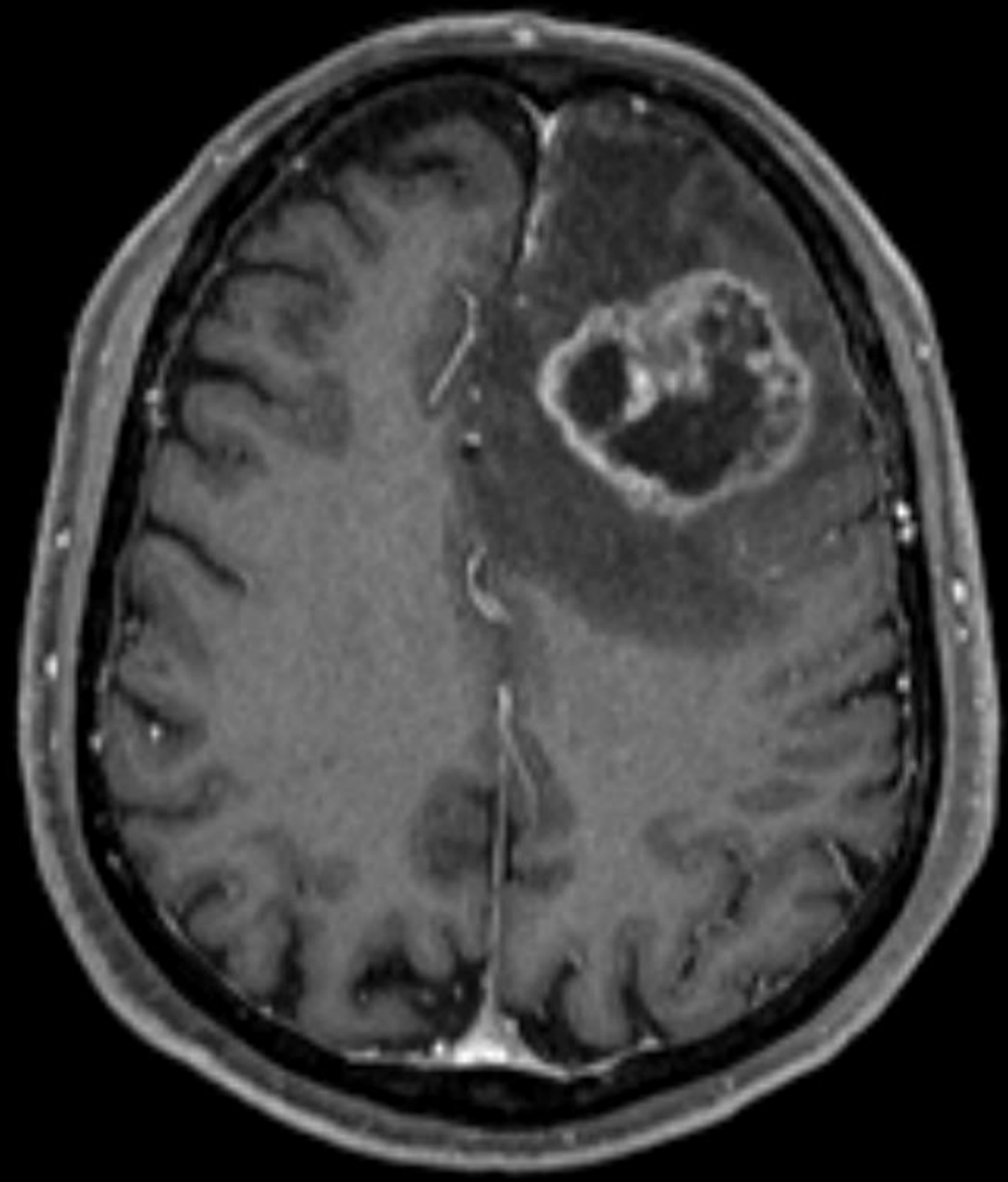
- You can see an obvious abnormality in the left frontal lobe. Let's see what happens when contrast is given.



Axial

MASSES

- There is peripheral rim enhancement!
- This turned out to be a GBM.



Axial

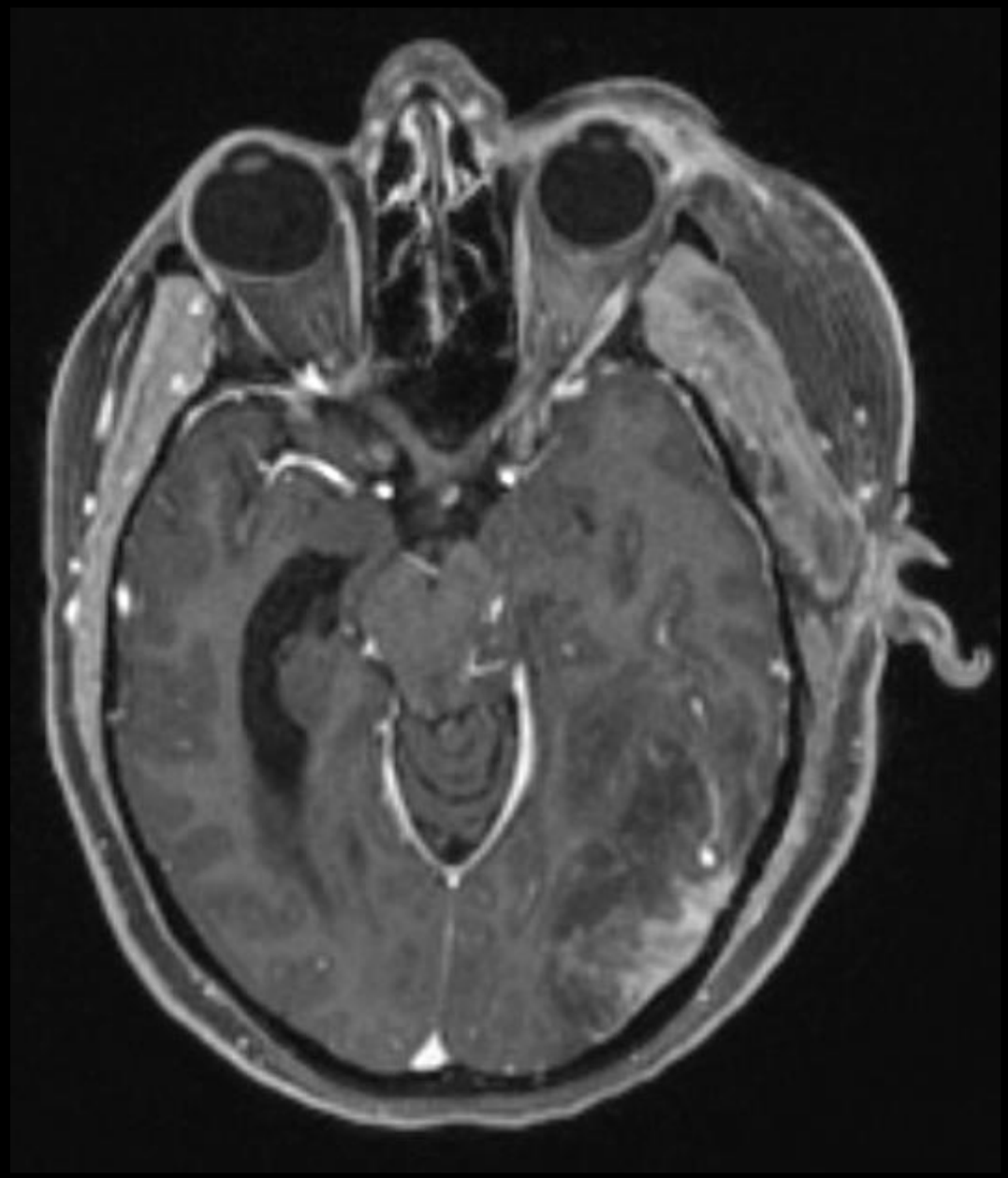
MASSES

- Mass Effect / Edema
- Probably one of the most important things to notice, at least emergently, is the effect that a mass has on the surrounding structures.
- Recall how to look for features of herniation syndromes and hydrocephalus.

MASSES

- Recall this case from before. One of the most important findings to note urgently is the mass effect being caused.

- Recall the left uncal and descending transtentorial herniation



Axial

MASSES

- Solitary vs Multiple
  - Roughly 50% of solitary adult brain tumors are metastases.
  - As soon as you start noticing multiple tumors, whether it is in an adult or a child, you are immediately thinking of metastatic disease above all other diagnoses.

MASSES

- Notice at least 2 intracranial enhancing lesions.
- Above anything else, you should be thinking about metastatic disease.

Axial

MASSES

- Notice at least 2 intracranial enhancing lesions.
- Above anything else, you should be thinking about metastatic disease.

These turned out to be metastatic deposits from a breast cancer primary.

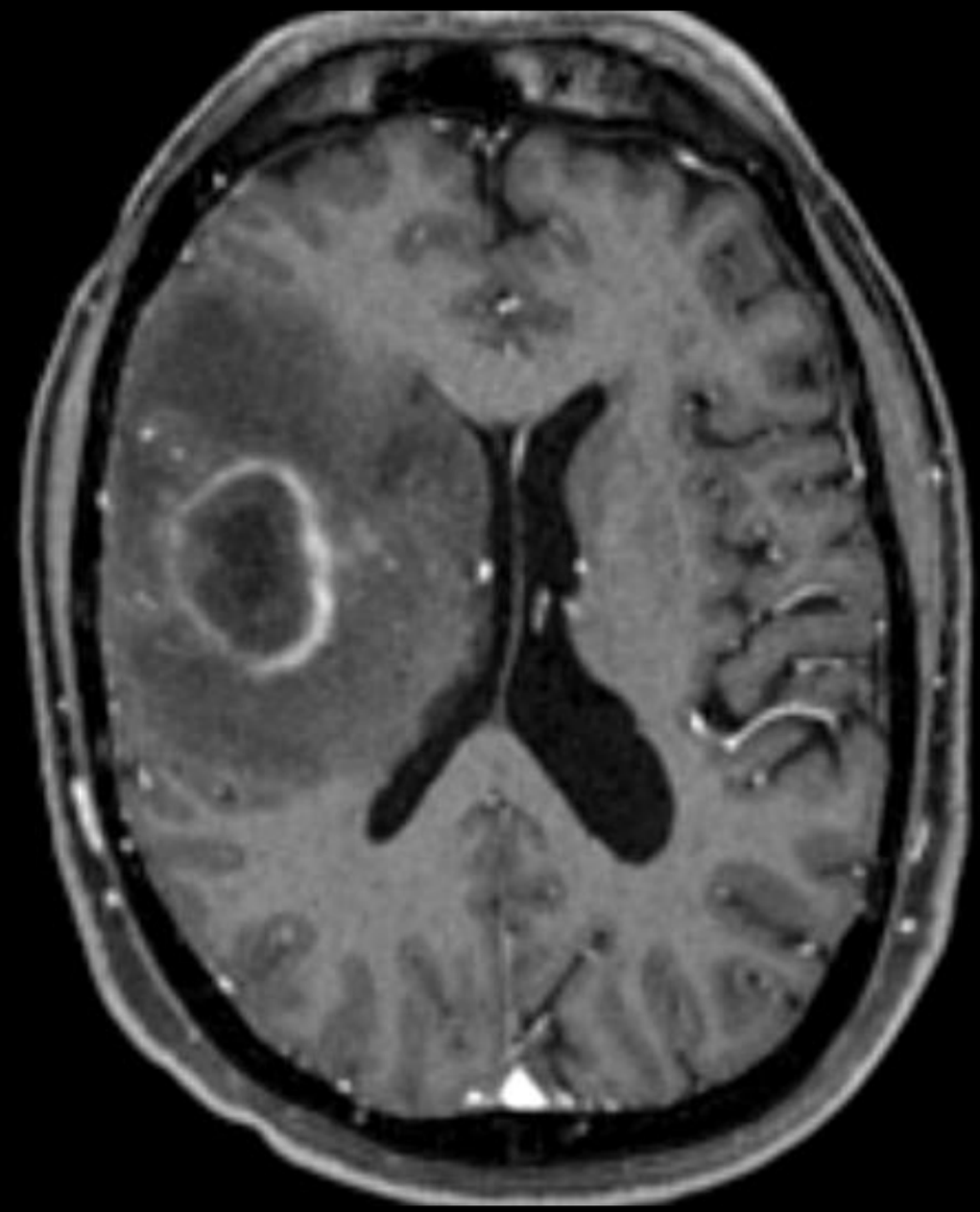
Axial

MASSES

- Mimics
  - Not all intracranial space occupying lesions are true masses.
    - Recall the differential of peripheral rim enhancement. Even that had a mimic in it: abscess.
    - Abscesses, other infections, chronic hematomas, MS, radiation changes can also mimic tumors.
    - In specific locations, consider aneurysms or other vascular malformations.

MASSES

- This is an example of an intracranial lesion. It demonstrates peripheral rim enhancement.
- Recall your differential...



Axial

MASSES

- This is an example of an intracranial lesion. It demonstrates peripheral rim enhancement.

- Recall your differential...

  This turned out to be an abscess!

  But on this image alone, you would have included metastatic disease and GBM as well.

Axial

End of module 5

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