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.
MASSSES

• 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
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.
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.
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.
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
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.
MASSES

- There is peripheral rim enhancement!
- This turned out to be a GBM.
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.
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
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.
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• Above anything else, you should be thinking about metastatic disease.

These turned out to be metastatic deposits from a breast cancer primary.
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...
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.
End of module 5

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