IN THE NAME OF GOD

MRI OF MS

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OUT LINES

- MRI OF MS
- Criteria Macdonald 2017
- MS Mimickers

- Multiple hyperintense lesions on T2 weighted sequences are the characteristic magnetic resonance imaging (MRI) appearance of multiple sclerosis (MS).

- The majority of the lesions are small, although they can occasionally measure several centimeters in diameter.

- Focal MS lesions are usually round or oval in shape and relatively well circumscribed.

- Most of the lesions – especially in the early stages of the disease – are discrete on conventional MRI and nonconventional MR techniques such as magnetization transfer imaging (MTI),diffusion weighted imaging (DWI) and MR spectroscopy.

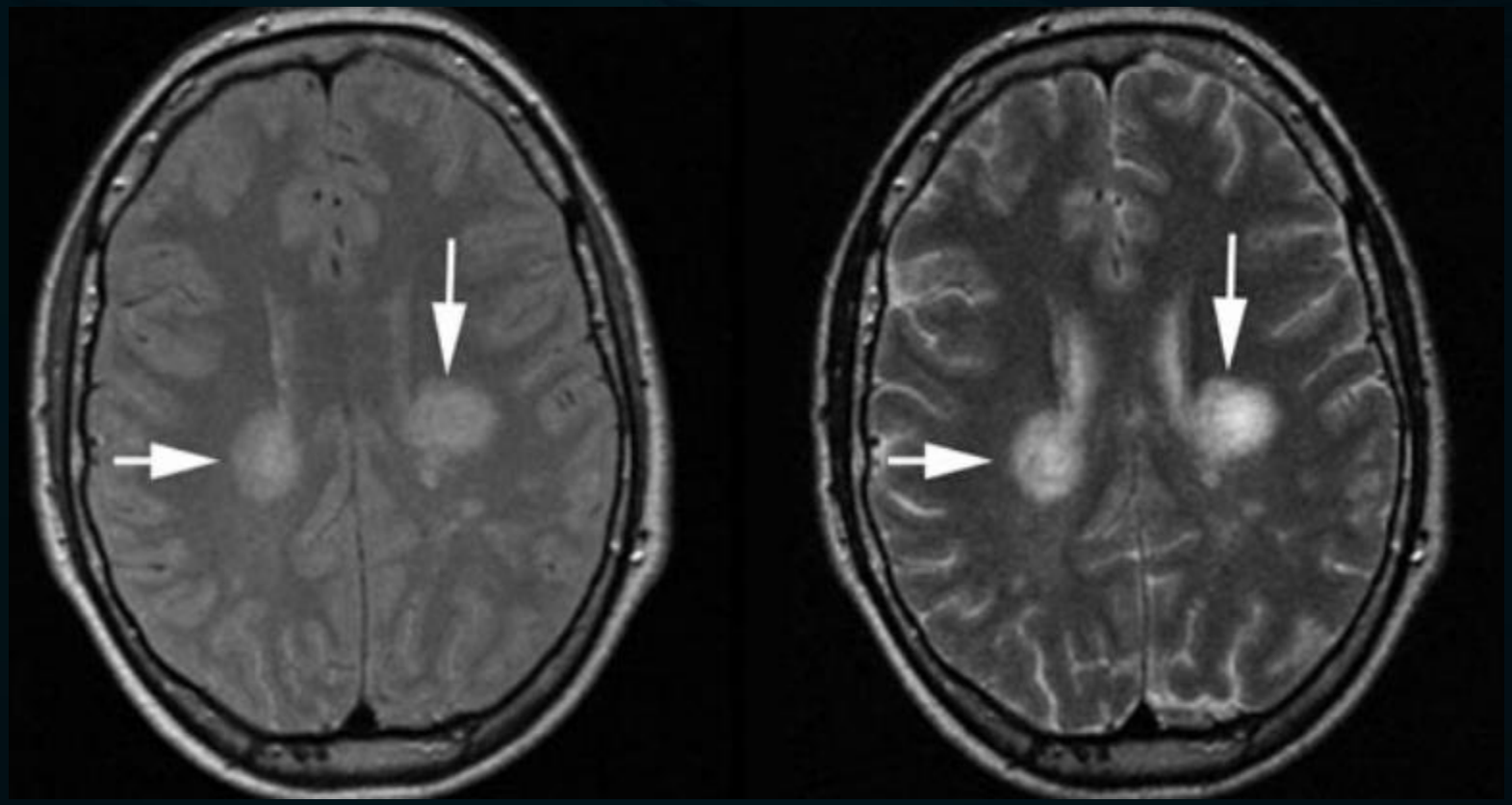
- Conventional T2-weighted MR images may also demonstrate diffuse, large, and irregular hyperintensities with poorly defined borders around the ventricles, especially adjacent to the occipital horn.

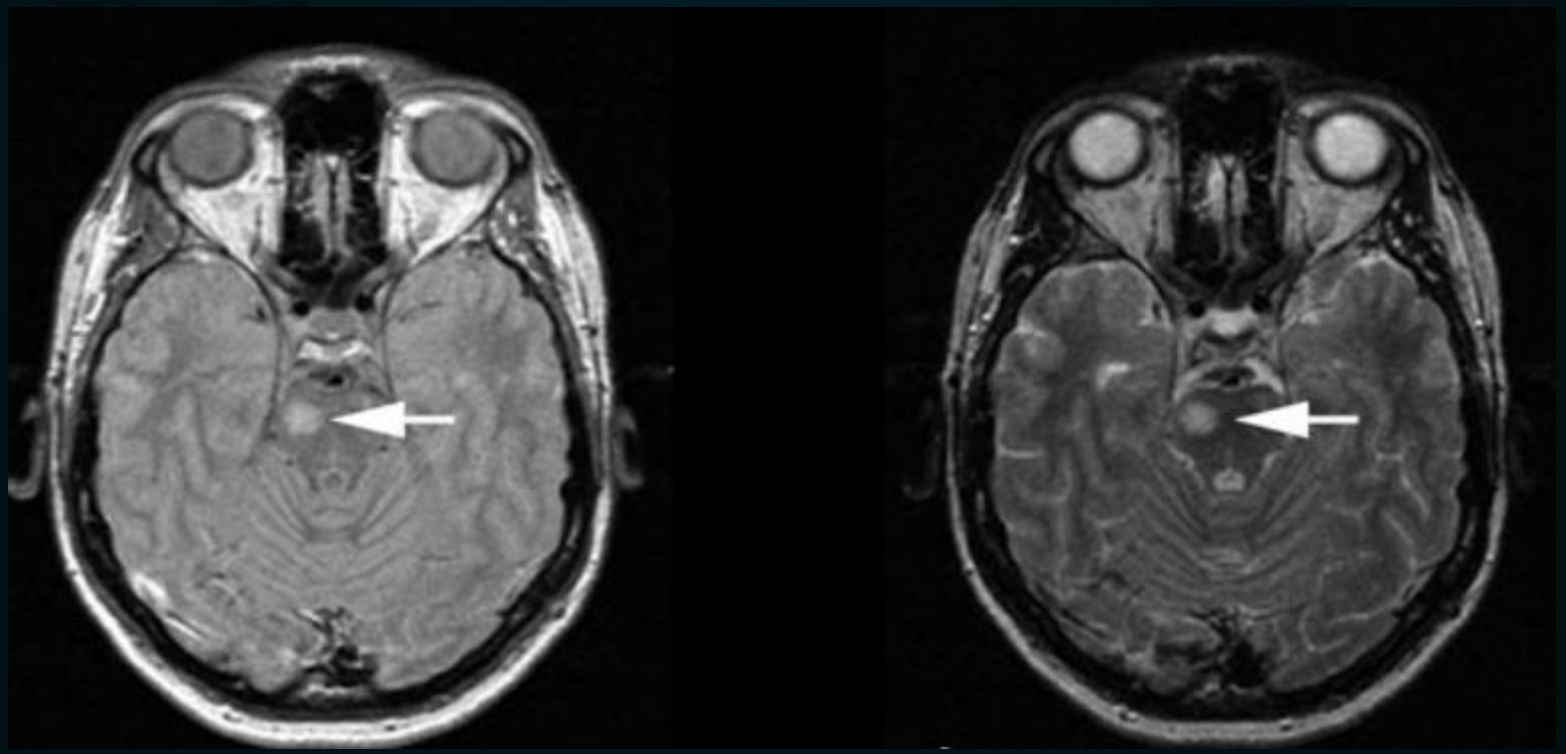
- They are known as dirty-appearing white matter (DAWM) and have been reported in 17% of the patients with remitting relapsing multiple sclerosis (RRMS).

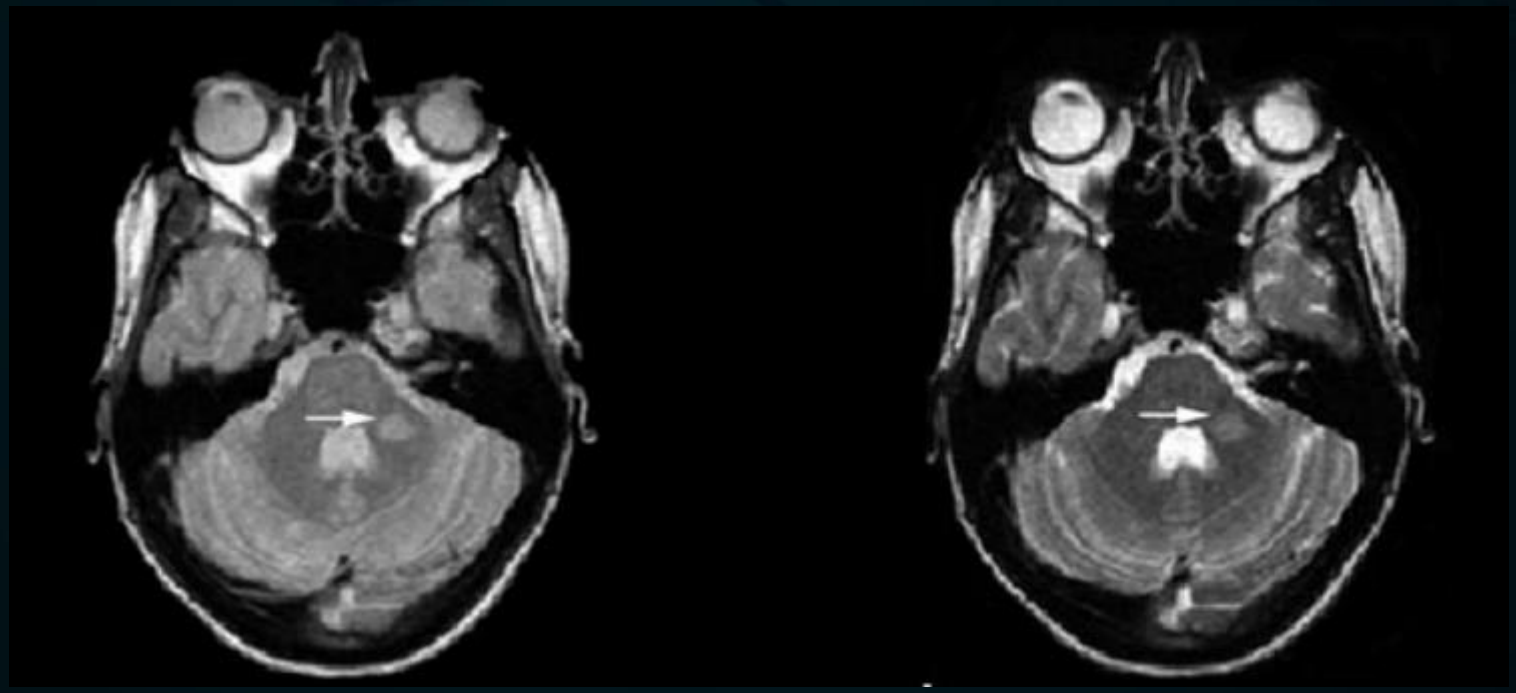
- Acute T2 lesions may show a halo of less striking hyperintensity, probably consistent with edema that resolves over time, and they reach their final size within about 6 months.

- With ongoing disease, new lesions or enlargement of preexisting lesions can be seen to occur simultaneously with the shrinkage of previously acute plaques.

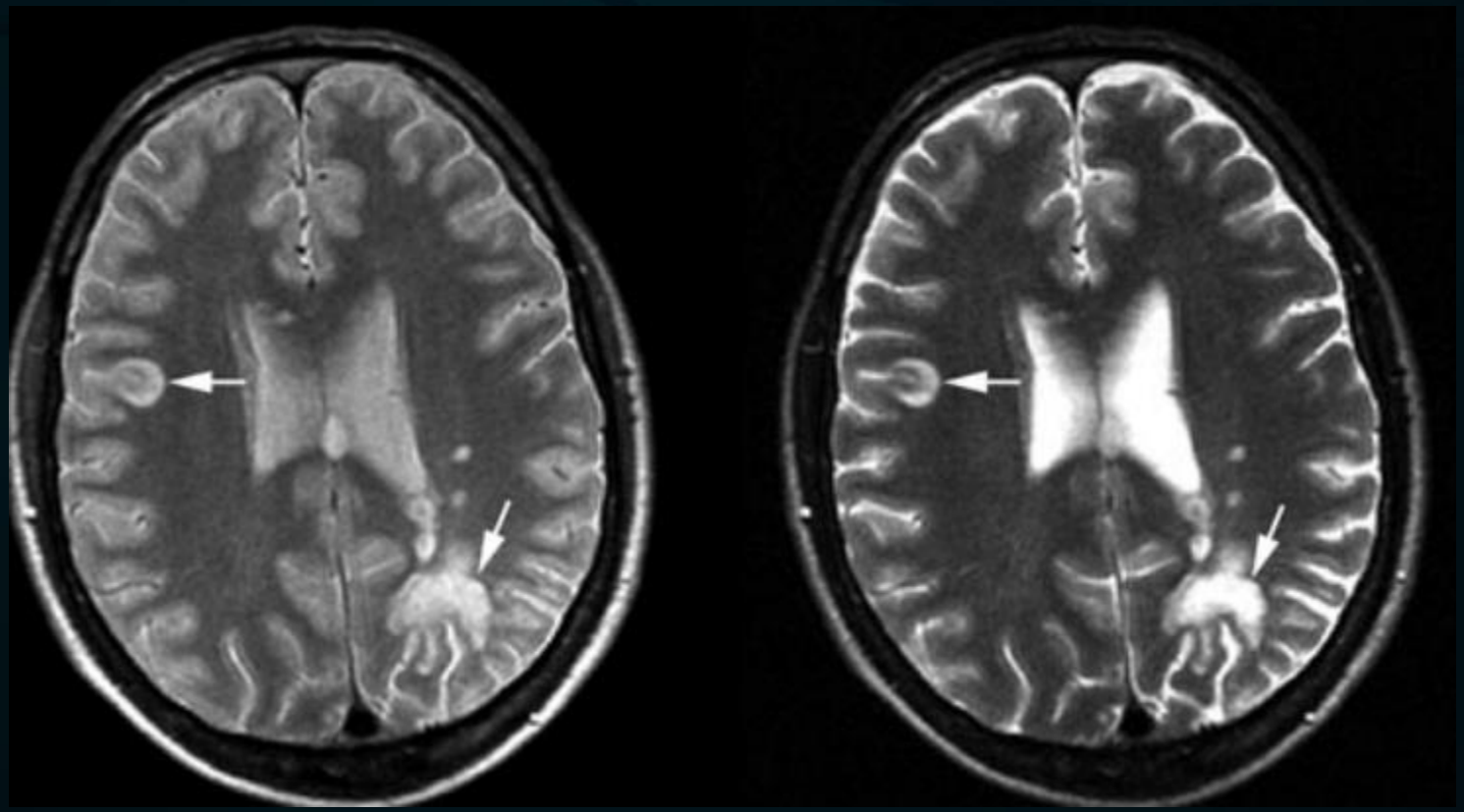
- **Most T2 lesions develop without clinical symptoms, but most clinical relapses are associated with new lesions on MRI .**





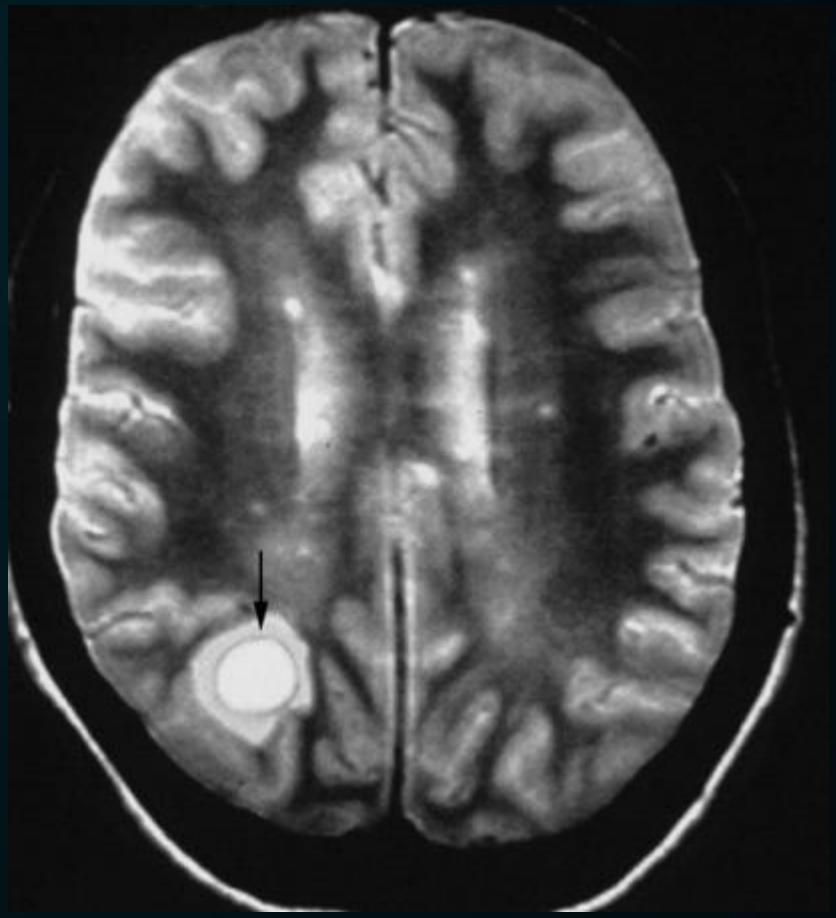


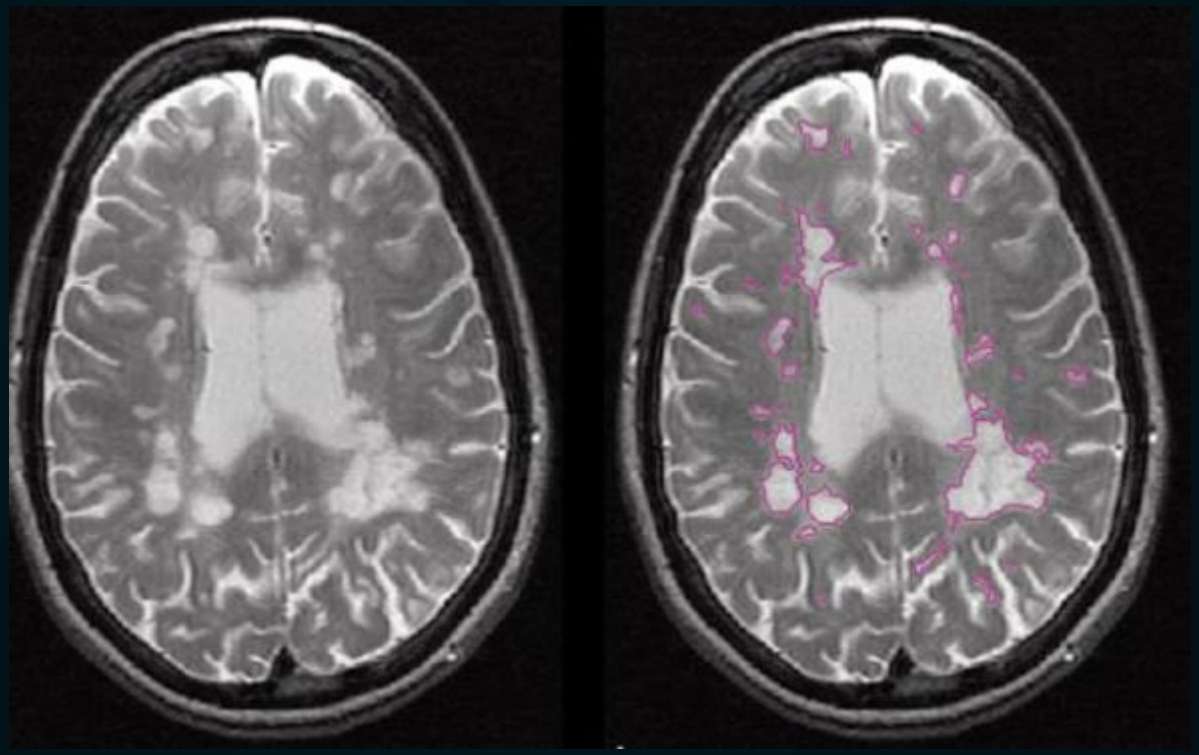
Note:
In MS and some other inflammatory diseases the middle cerebellar peduncles are preferentially affected. The reason is not clear



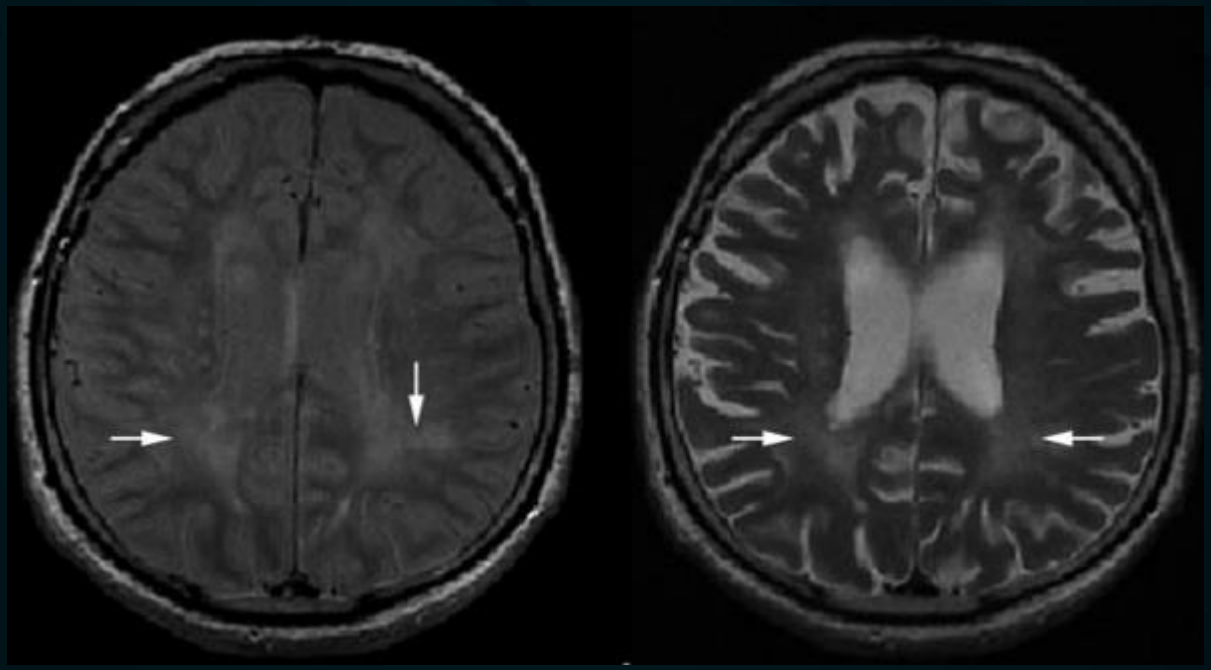
Note: MS lesions tend to involve U fbers in the juxtacortical area. In Binswanger’s disease U fbers are usually spared

Note: Acute lesions may have a complex pattern in T2-weighted images with a central hyperintensity, surrounded by an iso- to hypointense ring (*black arrow*) and another hyperintense signal around the isointense ring

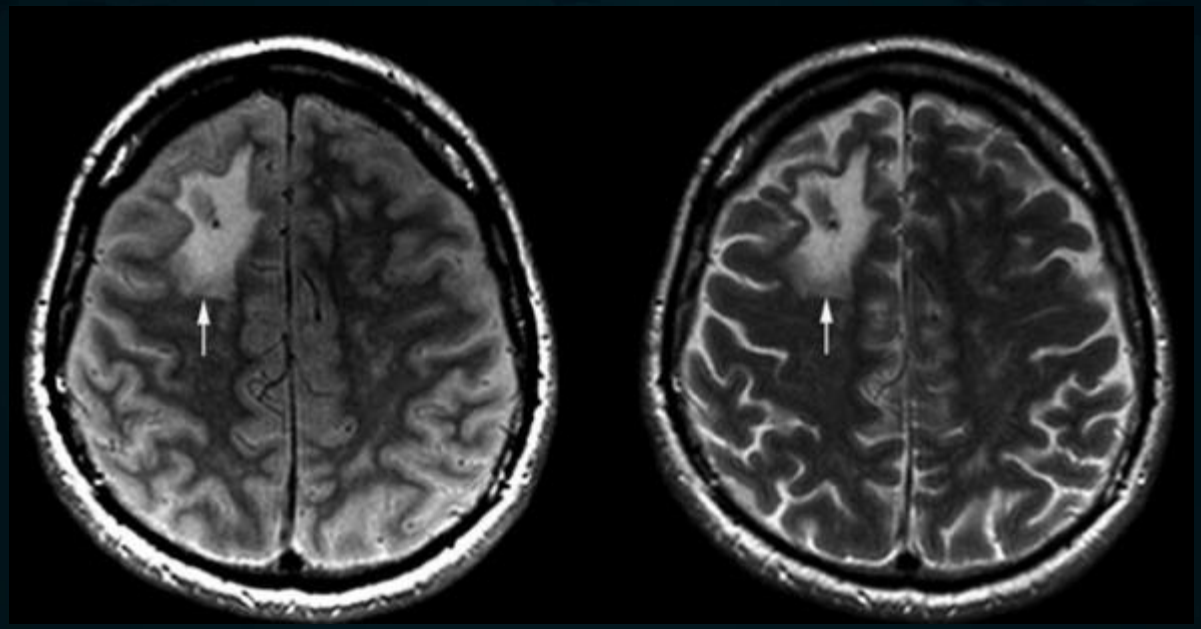




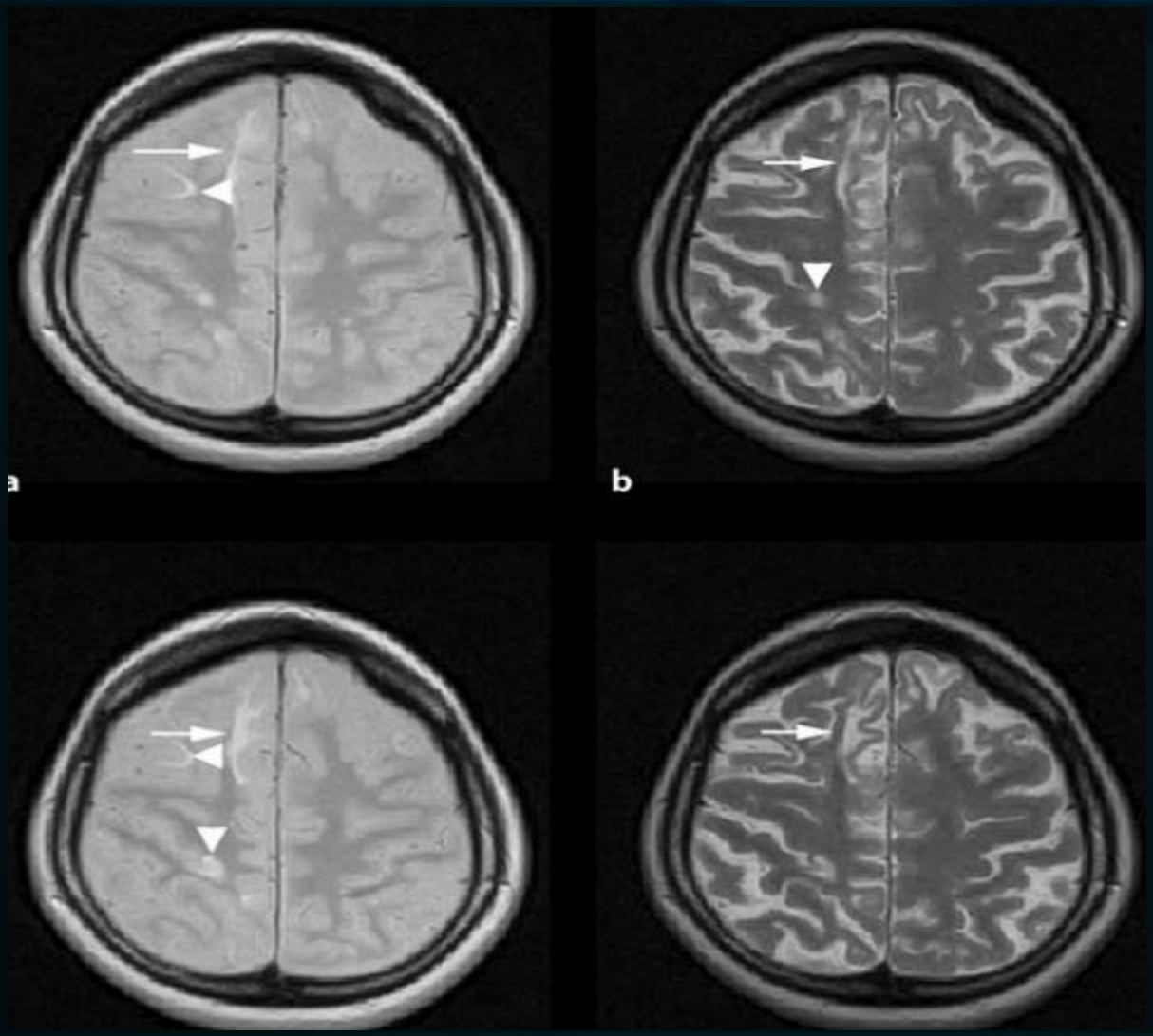
This patient has a high lesion volume load. Note: T2 lesion volume load may be mild (few lesions), moderate (multiple lesions, partially confluent), and severe (many, confluent lesions)



Note: In contrast to normal-appearing white matter (NAWM), subtle, abnormal, and diffuse signal intensity changes are often seen on T2-weighted images, which have been referred to as dirty-appearing white matter. Their signal intensity is slightly higher than NAWM but lower than real lesions

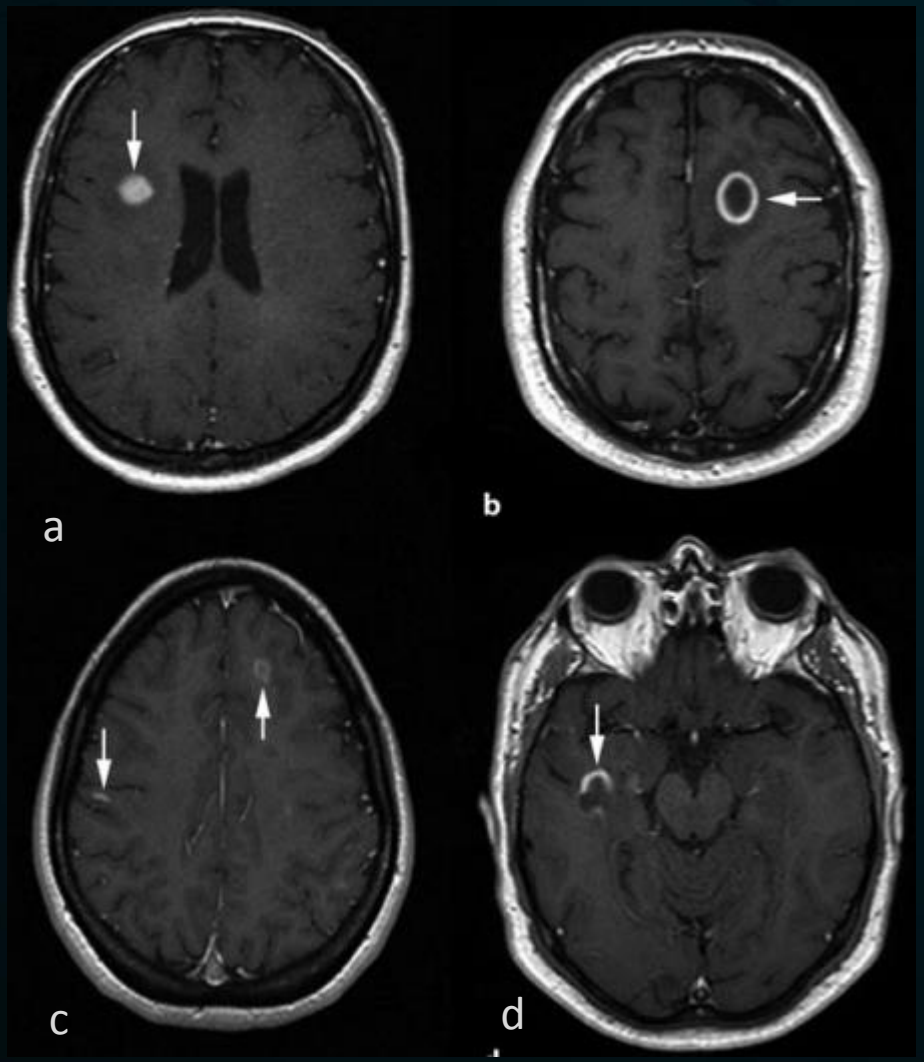


patient with MS demonstrate a large atypical lesion in the right frontal lobe (*arrows*). Central isointensity is due to tissue changes after biopsy



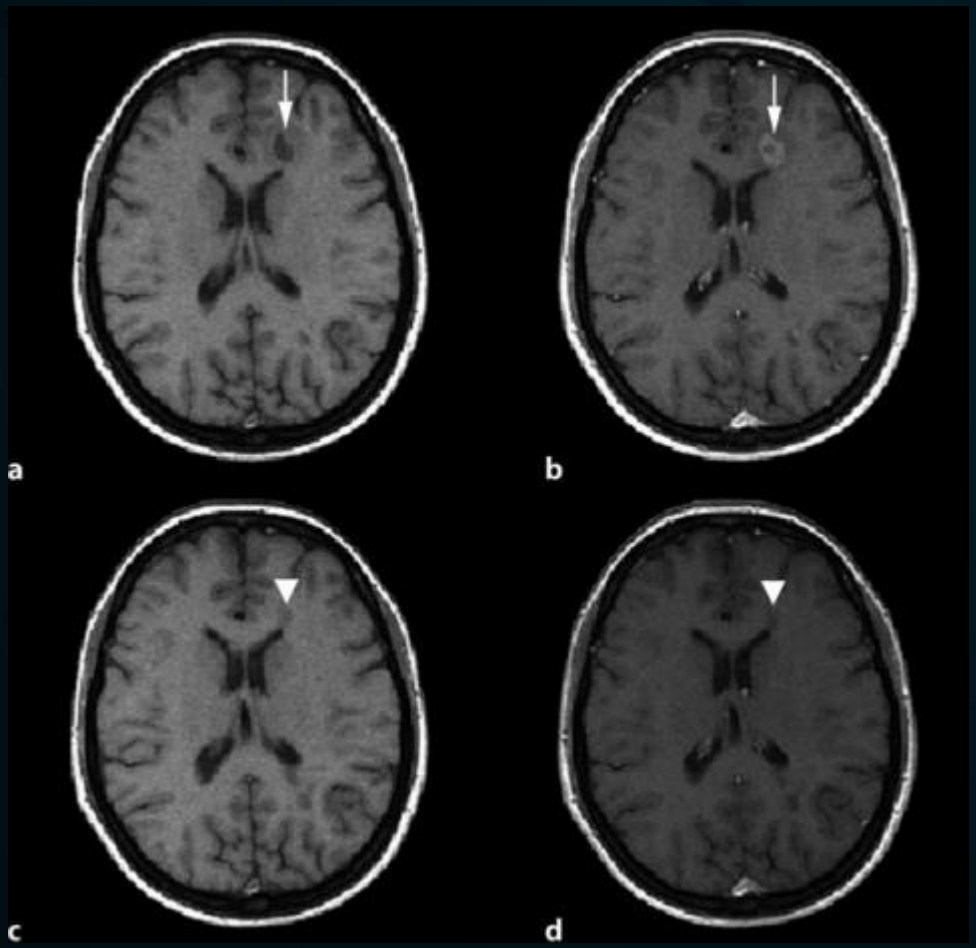
Other lesions involving U fibers ,**Special attention should be given to this kind of atypical lesions in patients who receive medication evoking progressive multifocal leukoencephalo pathy (PML**)

- In MS, most new lesions go through a phase of enhancement that usually persists for 2–6 weeks.
- Only a small number of lesions demonstrates enhancement for 3–4 months .
- Very rarely, plaques may enhance for more than 6 months



Note: Most enhancing lesions are of nodular type with a homogenous pattern of enhancement (a), but other patterns like complete ring enhancement (b), incomplete ring shape (d), or linear shape enhancement (c) may be seen in MS

- The size of enhancing lesions differs from a few millimeters to several centimeters, but they are usually small and have little to no mass effect



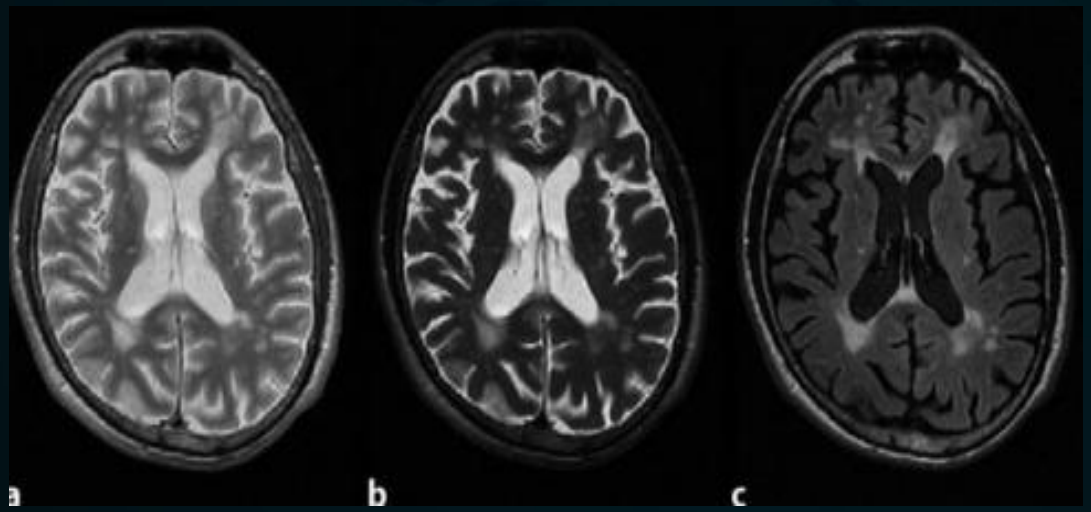
T1-weighted without (a) and with (b) contrast images demonstrate an acute hypointense lesion on the T1-weighted image with the corresponding enhancing lesions (*arrows*). Follow-up images after 6 months (c,d) demonstrate that the contrast-enhanced lesion has disappeared, but a hypointense lesion has developed on the T1-weighted image with contrast (*arrowheads*).

Note: **Hypointense lesions that persist for a minimum of 6 months after their first appearance are called persistent or chronic black holes. These lesions seem to be associated with greater tissue destruction and axonal loss**

- Atrophy of the brain and spinal cord has been recognized as part of MS pathology for a long time. Several studies have demonstrated annual decrease in brain volume of MS patients, ranging from **0.6 to 1%, compared with 0.1 to 0.3%** in the general population during the normal aging process .

- The correlation between brain atrophy and clinical disability seems to be stronger than is T2-lesion load .

- **that whole-brain atrophy changes in the first 2 years were the best MRI predictor of the 8-year EDSS score**.



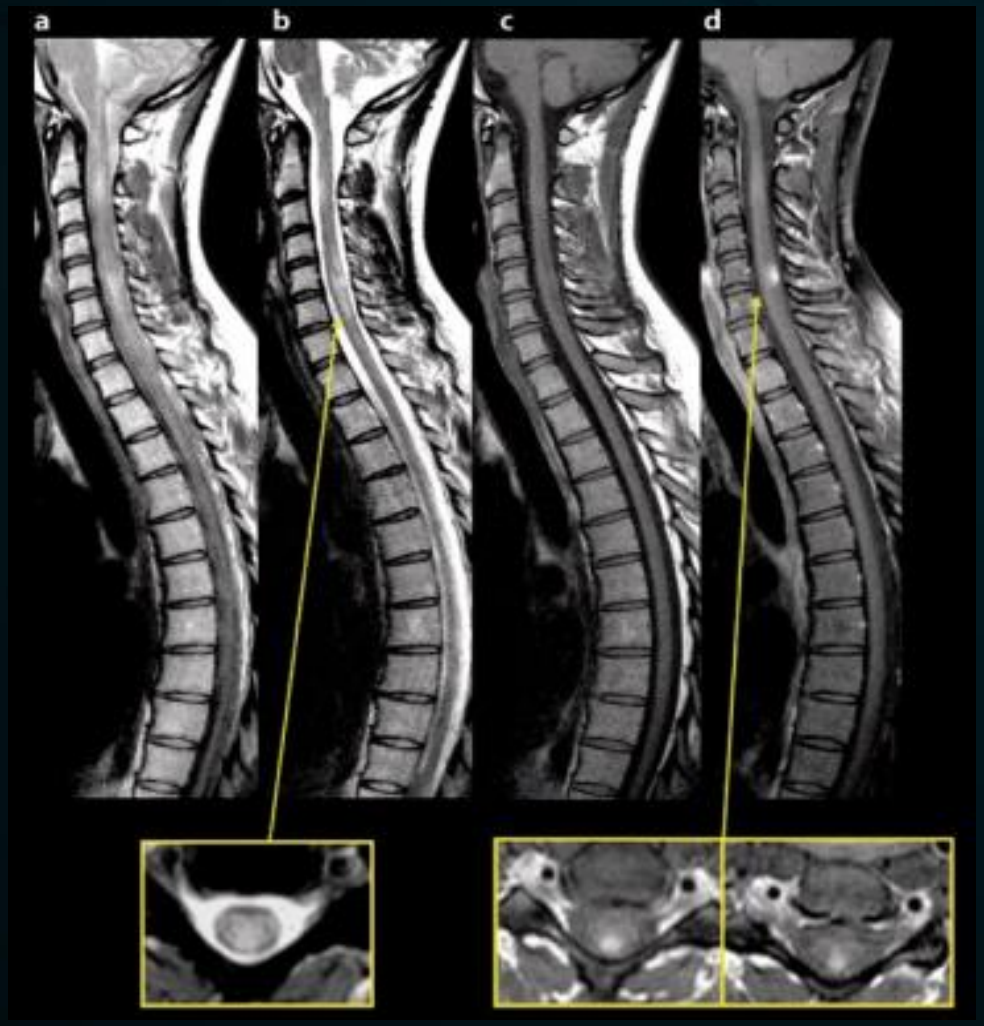
Brain atrophy reflects the net result of the irreversible and destructive pathological process in MS. Gross morphological changes may be seen on standard magnetic resonance imaging and may appear more prominent on **FLAIR** sequences

- Although the spinal cord is frequently involved in MS, up to now MRI of the cord is only performed for a number of special indications.

- In particular,it is rarely performed as a screening examination together with MRI of the brain.

- Plaques in the spinal cord tend to be located in the periphery of the cord and usually do not respect the boundaries between gray and white matter .

- Most commonly, the demyelination affects the dorsolateral aspects of the cord. Acute lesions are often associated with cord swelling and may show contrast enhancement.
  on T1-weighted images



acute focal lesion is noted with local swelling and pathological contrast enhancement on the sagittal T1-weighted image. The transverse images demonstrate the location of the lesion in the dorsal aspect of the cord

2017 McDonald criteria

DIS

≥1 lesion in each of ≥2 characteristic locations

1. periventricular: ≥1 lesions
2. **cortical-juxtacortical: ≥1 lesions**
3. Infratentorial: ≥1 lesions
4. spinal cord: ≥1 lesions

*All lesions in **symptomatic regions included**

- Simultaneous presence of gadolinium-enhancing and non-enhancing lesions at any time -**symptomatic or asymptomatic**-
  ***Optic nerve lesions are an exception**

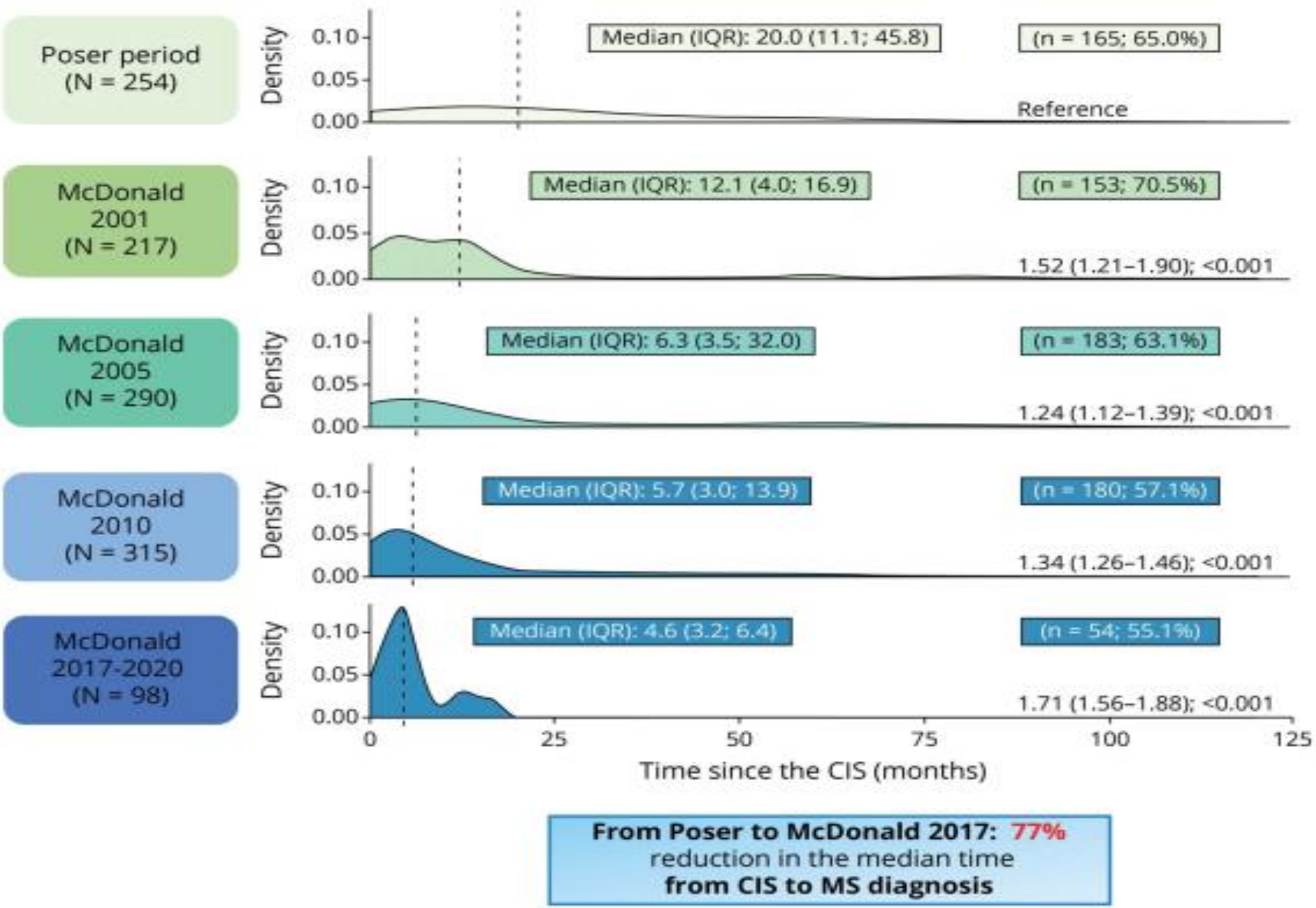
DIT

- A new T2 or gadolinium-enhancing lesion on follow-up MRI regardless of timing of baseline scan
- The **presence of cerebrospinal fluid (CSF) oligoclonal bands (OCBs**) as substitute for demonstrationof DIT

2017 McDonald criteria

- In a patient with a
  - ❑ **typical** clinically isolated syndrome
  - ❑ fulfilment of clinical or MRI criteria for dissemination in space
  - ❑ **no better explanation** for the clinical presentation,
  - ❑ demonstration of **CSF-specific oligoclonal bands** in the **absence of other CSF findings atypical** of multiple sclerosis
    - ❖ **an elevated protein concentration of >100 mg/dL,**
    - ❖ **pleocytosis with >50 cells per mm3,**
    - ❖ **the presence of neutrophils, eosinophils, or atypical cells**

- allows a diagnosis of this disease to be made.



From Poser to McDonald 2017: 77% reduction in the median time **from CIS to MS diagnosis**

- A higher proportion of patients diagnosed with MS and treated was found in more recent diagnostic criteria periods

- A sustained decrease in the time from CIS to MS diagnosis and to treatment initiation was observed throughout diagnostic criteria periods

- Patients diagnosed in more recent diagnostic criteria periods displayed a lower risk of reaching disability milestones

MS MIMIKERS

- One of the most common questions in daily practice when we see an image like the one on the left is:

- *'Do we have to think of Multiple Sclerosis?*

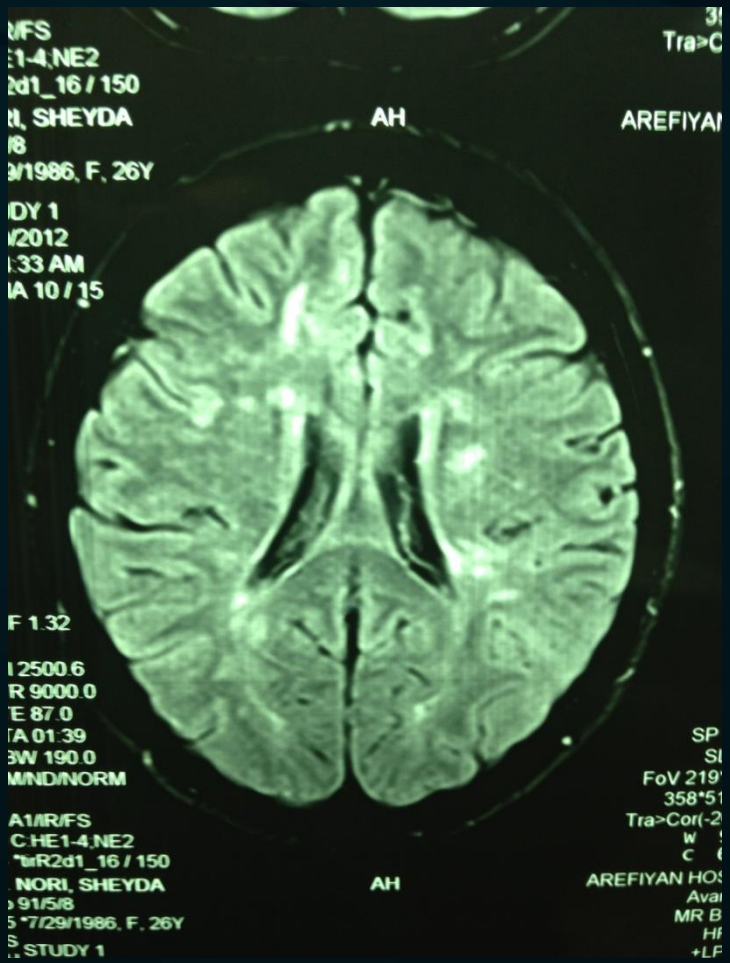
- *Or are these white matter lesions the result of small vessel disease, as in a hypertensive patient?*

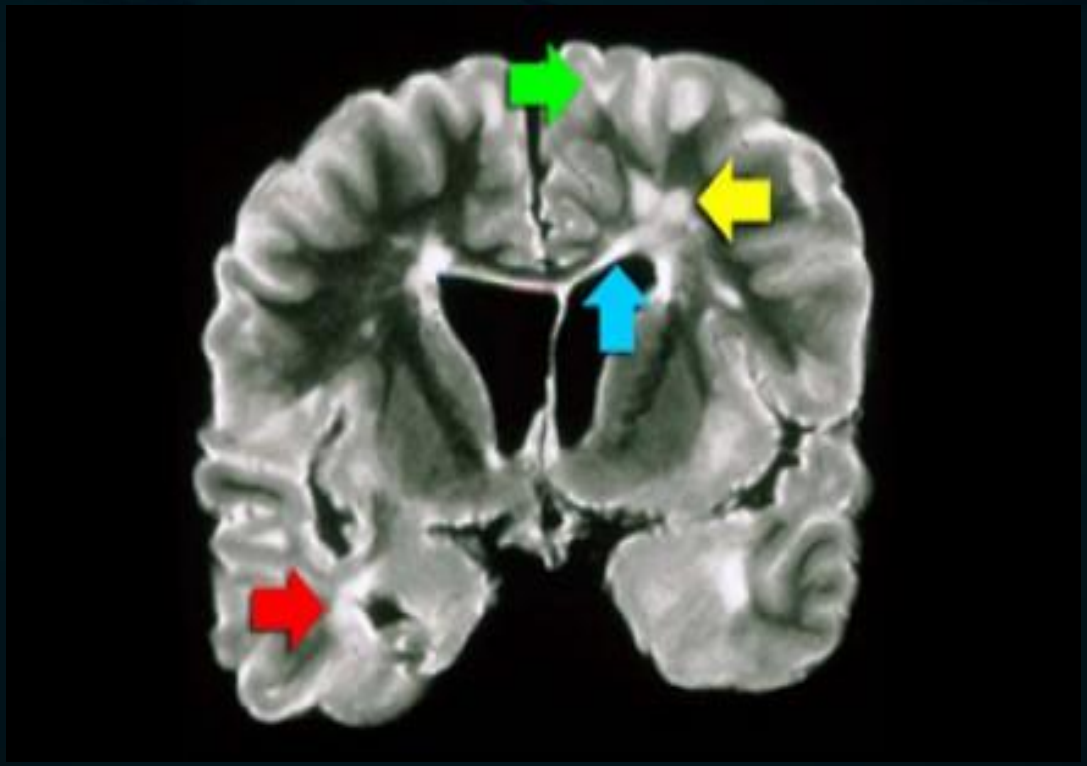
- Many neurological diseases can mimic MS both clinically and radiologically.
- Most incidentally found WMLs will have a vascular origin.
- The list of possible diagnoses of WMLs is long.

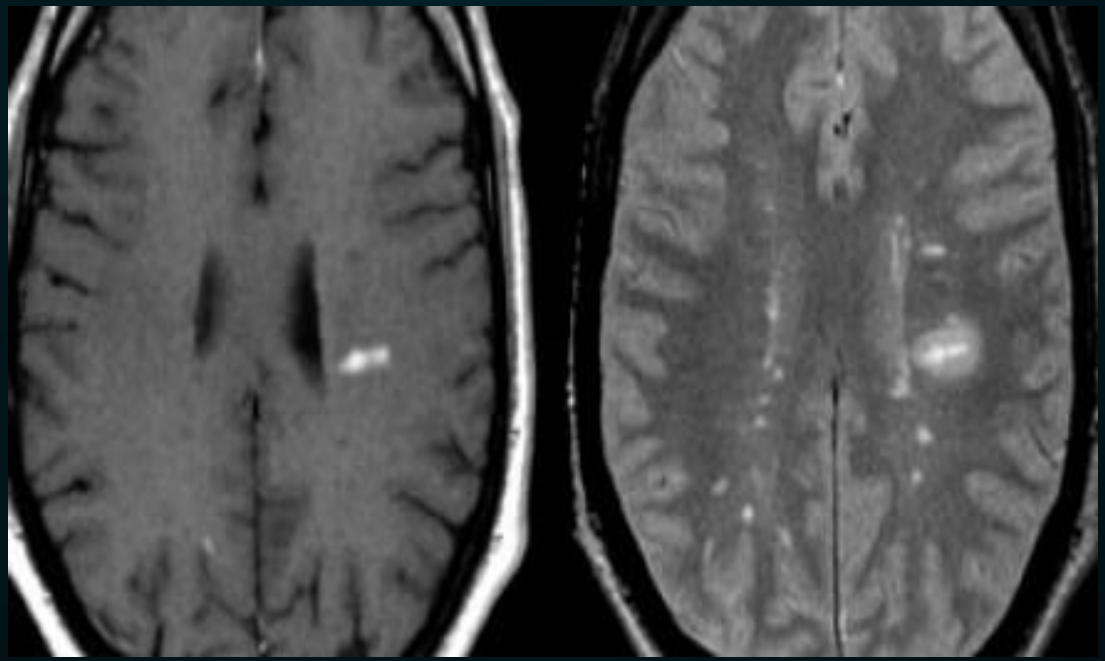
Distribution of White Matter Lesions

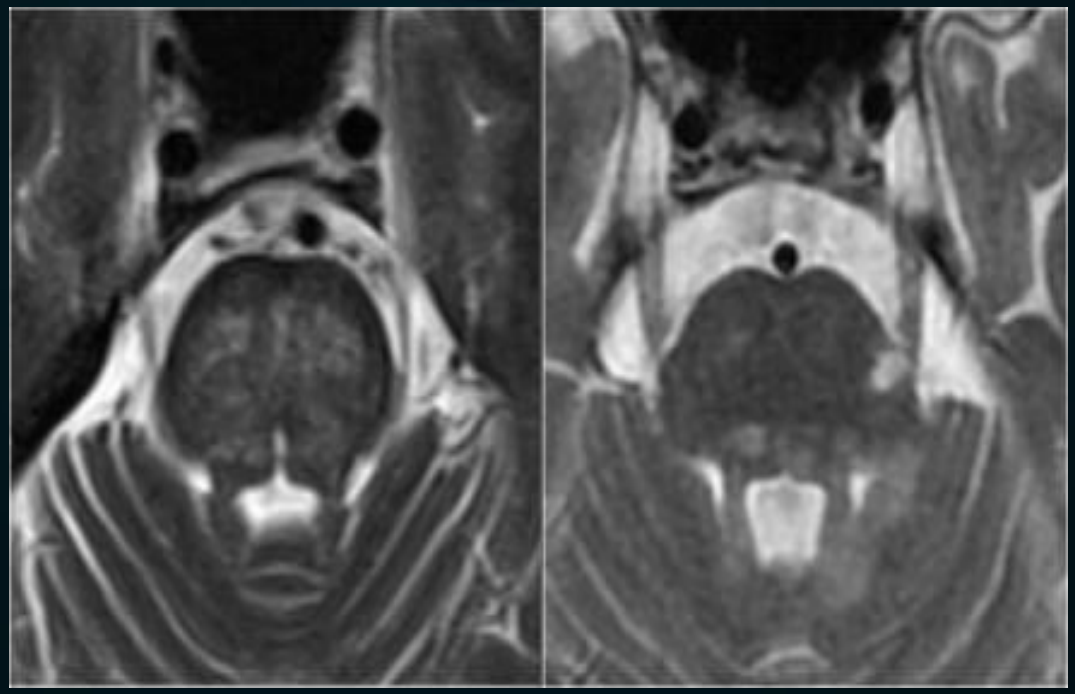
	Vascular	MS
Corpus callosum	- uncommon	- common
U-fibers	- uncommon	- common
Cortical lesions	- infarction	- sometimes
Basal nuclei	- typical	- uncommon
Infra tentorial	- uncommon	- typical
Temporal lobe	- uncommon	- early involvement
Periventricular	- uncommon	- typical
Spinal cord	- uncommon	- typical
Gd-enhancement	- no	- yes
Dawson fingers	- no	- typical
Distribution	- asymmetric	- symmetric/diffuse

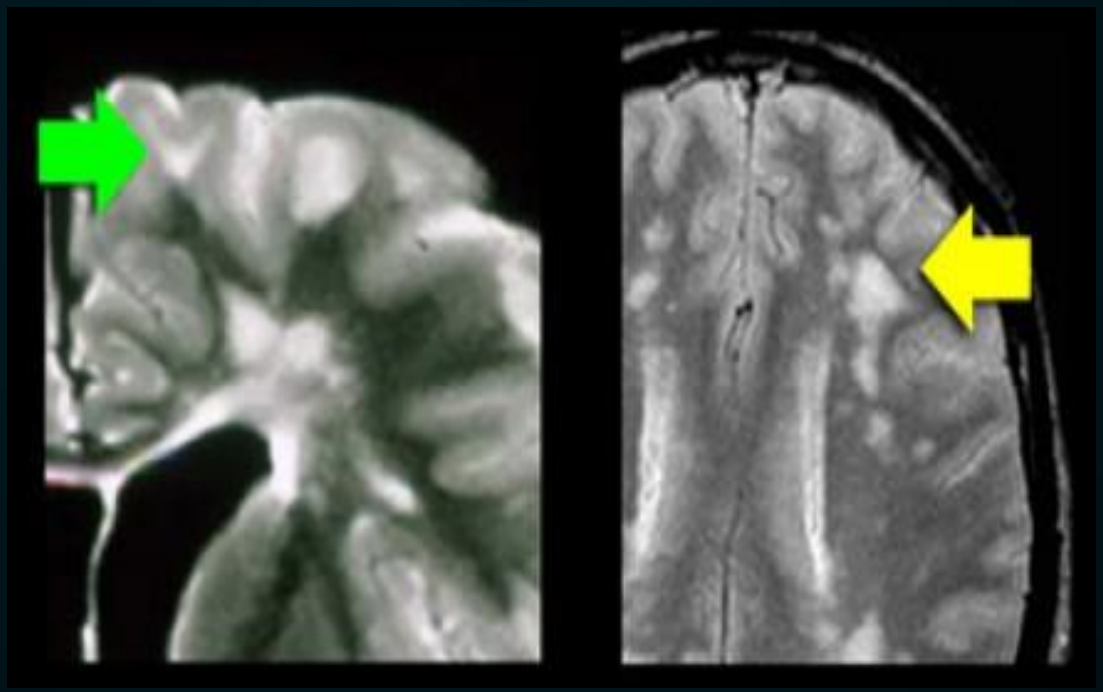
MS



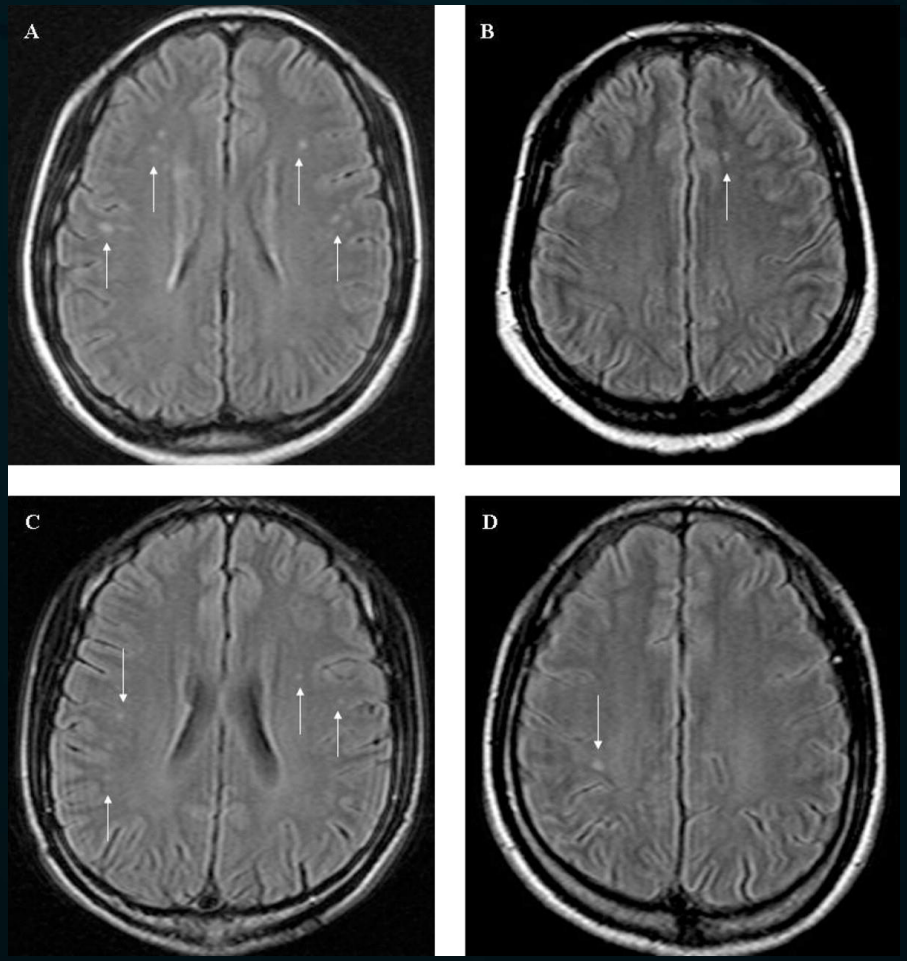




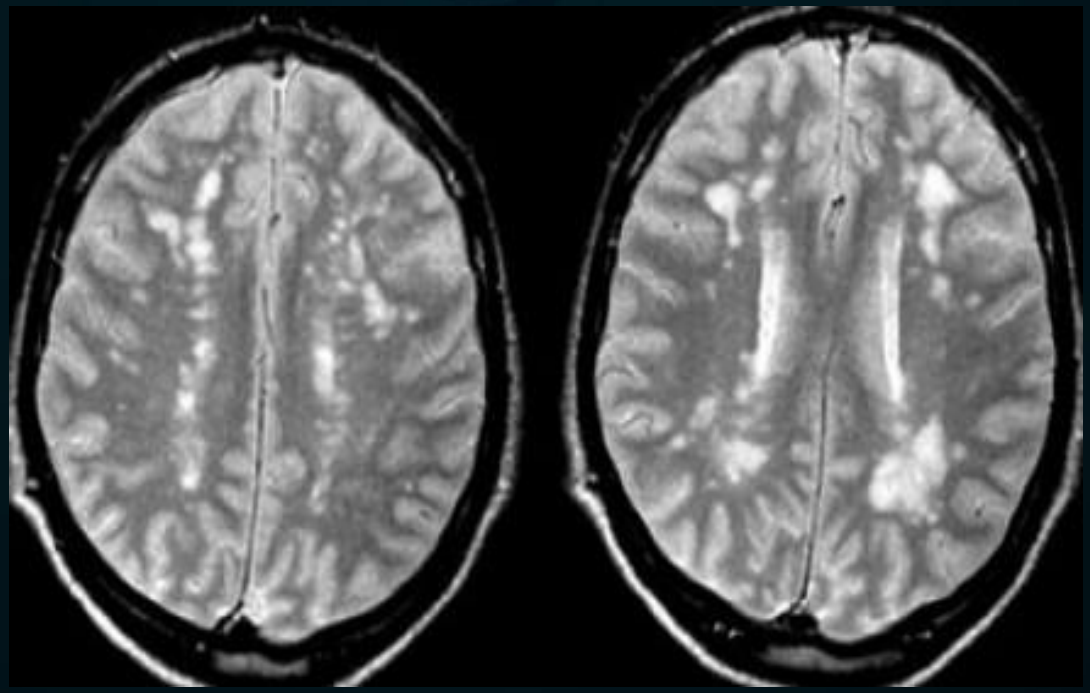




Migraine



Hypertension



PFO

- 41 years old female
- Presented by temporary diplopia and vertigo

- Cinovex had been started for patient

- Due to continuation of symptoms Cinovex had been changed to Recigen

RH
5cm
Tra>Sag(-0.7)
W 1059
C 515
A1/R/FS
p2 MNDNORM/FM/FIL
HFS
ATAEI, FOZYEH
MR:9405103?
STUDY 1
4:07:21 PM
A
Tra>Sag(-0.7)
W 1140
C 575
A1/R/FS
p2 MNDNORM/FM/FIL
HFS
ATAEI, FOZYEH
MR:9405103?
STUDY 1
4:08:54 PM
A

- Cervical MRI: normal
- OCB: neg
- TEE revealed PFO and


THANK YOU