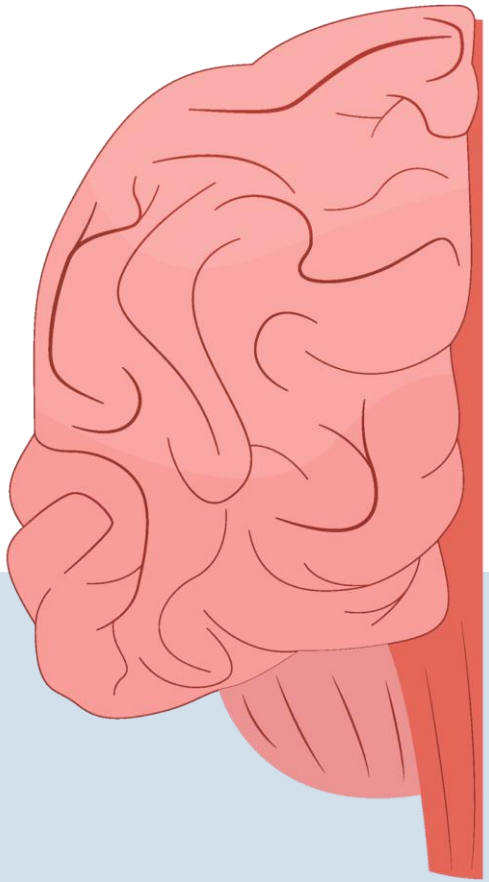
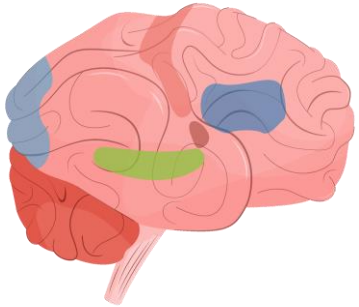


Case presentation

M/48 with past history of DM and old CVA fell down with multiple laceration

Presenter: Clerk5王煒甯

Clinical Data



- **Chief complaint**

Multiple contusion over limbs and trunk after falling from bed 2 days ago

- **Past history**

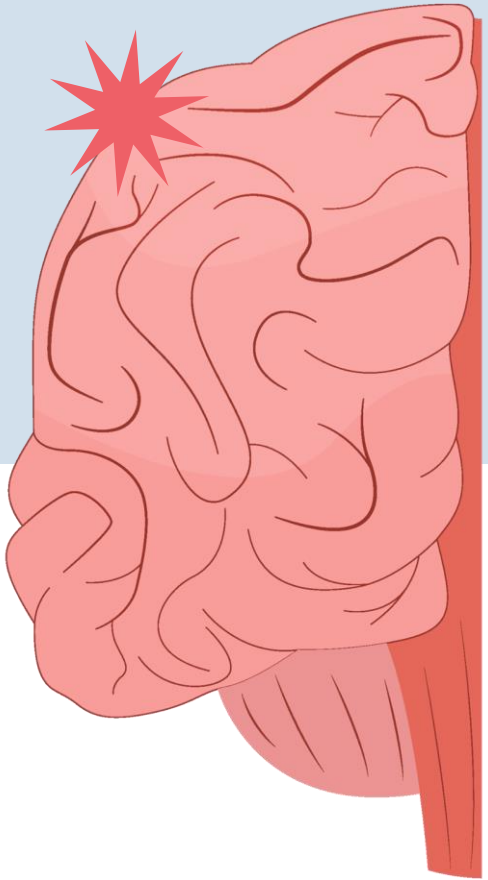
1. DM
2. old CVA

- **Present illness**

1. left side weakness
2. neck pain with midline tenderness

- **PE findings**

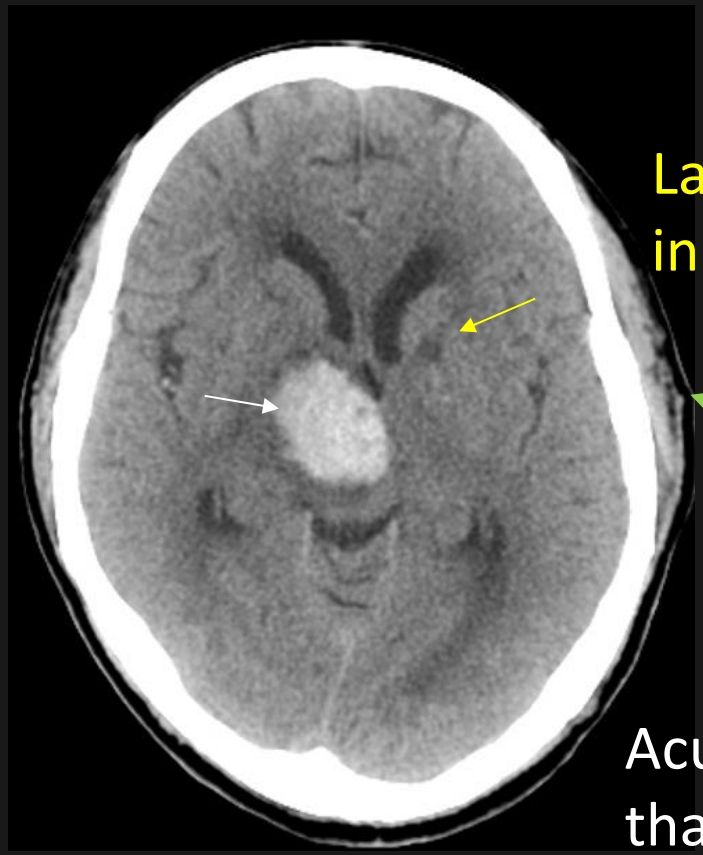
1. Mental state: drowsy
2. E3V3M6



2022-01-31

Brain CT without contrast

- acute hematoma in the **right thalamus** ∵**hypertensive** CVA
- The hematoma ruptures into the **ventricles** → **mild hydroce phalus**
- several old small **lacunar infarctions** in left putamen, posteri or limb of left internal capsule, right corona radiata, anterior limb of right internal capsule
- This **is not a case of head injury**, is **hypertensive stroke**



Lacunar infarction in left putamen

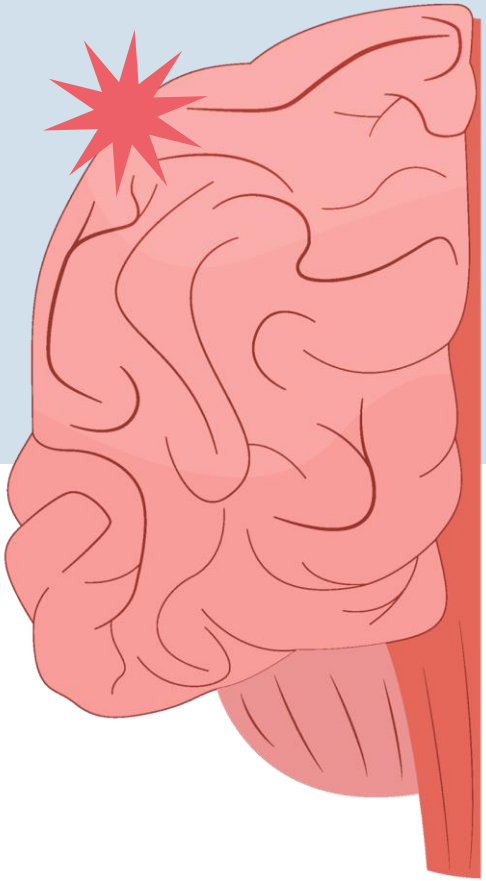
Scalp hematoma due to falling (but hypertensive ICH is the reason for falling)

Acute hematoma in thalamus ruptures into 3rd ventricle

Lacunar infarction in anterior limb of right internal capsule

Lacunar infarction in posterior limb of left internal capsule

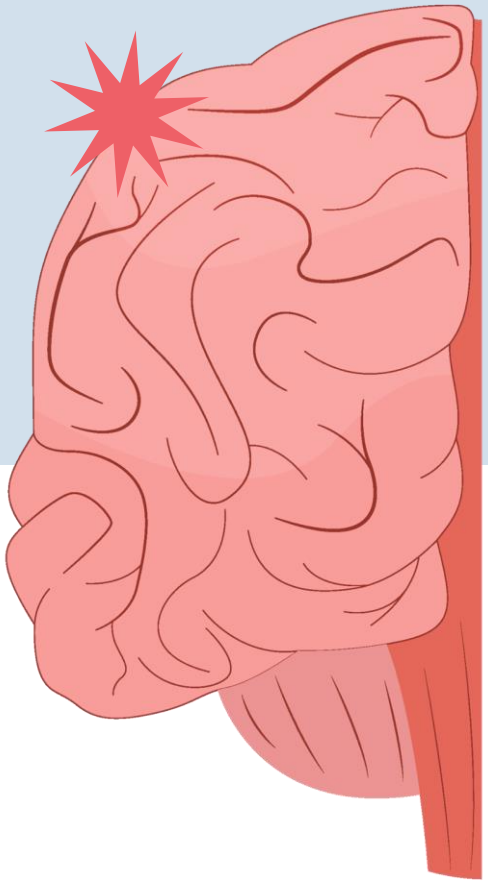
Lacunar infarction in right corona radiata



2022-02-05

Brain MRI

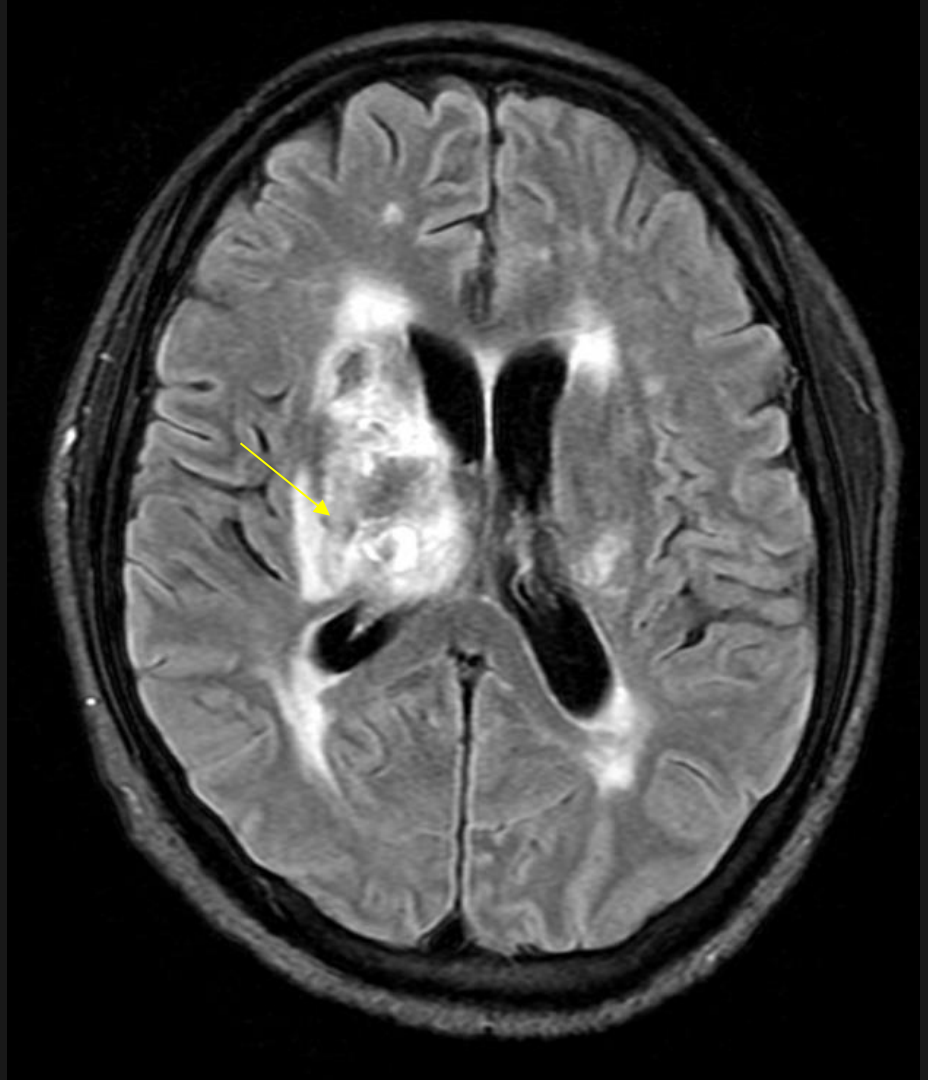
- Focal **brain sulci mild widening** over both frontal-parietal region
- Multiple **hyperintensities** on both T2WI and FLAIR images over **subcortical white matter** of bilateral **frontal-parietal and perivent ricular** regions are noted, the possibility **of SAE with demyelinatio n or gliosis change** is considered.
- Focal **hypointensity** area on SWAN, and mixed signal intensity on T1WI, T2WI and FLAIR MRI from hematoma surrounding with **peri focal edema over right thalamus and corona radiata region** is not ed, possibility of **hypertensive ICH** insult is considered.



2022-02-05

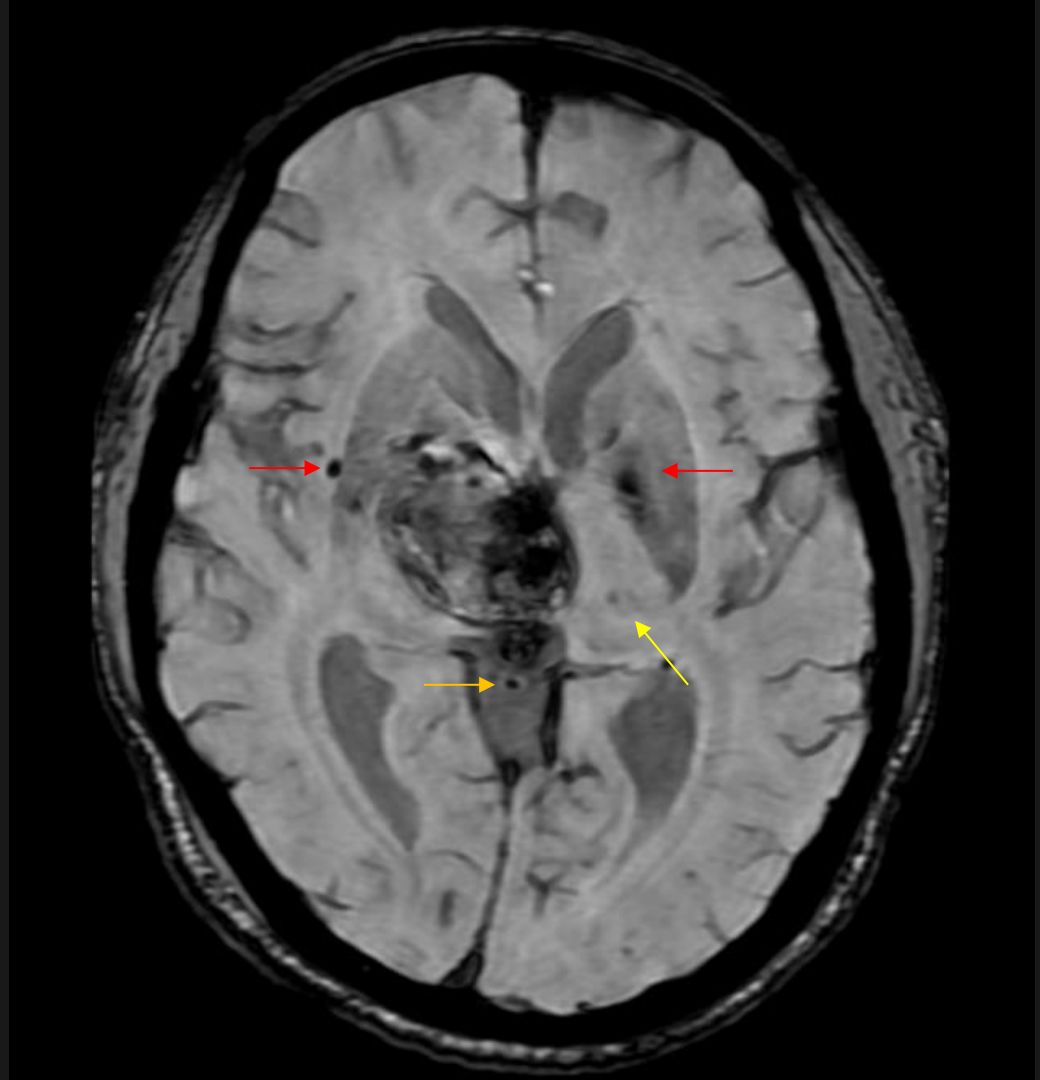
Brain MRI

- Suspicious minimal amount **IVH** and mild **hydrocephalus**
- Multiple hyperintensity area on both T2WI and FLAIR images wit hout diffusion restriction and some lesions with focal hypointensi ty on FLAIR images over **both corpus striatum, lentiform nucleus, corona radiata and left thalamus** region are noted, the possibilit y of **multiple old lacunar infarct lesion** is considered.
- Multiple small hypointensity area on SWAN over bilateral lentifor m nucleus, left thalamus and pons region are noted, possibility of **old microbleeding** from hypertensive ICH insult is considered.

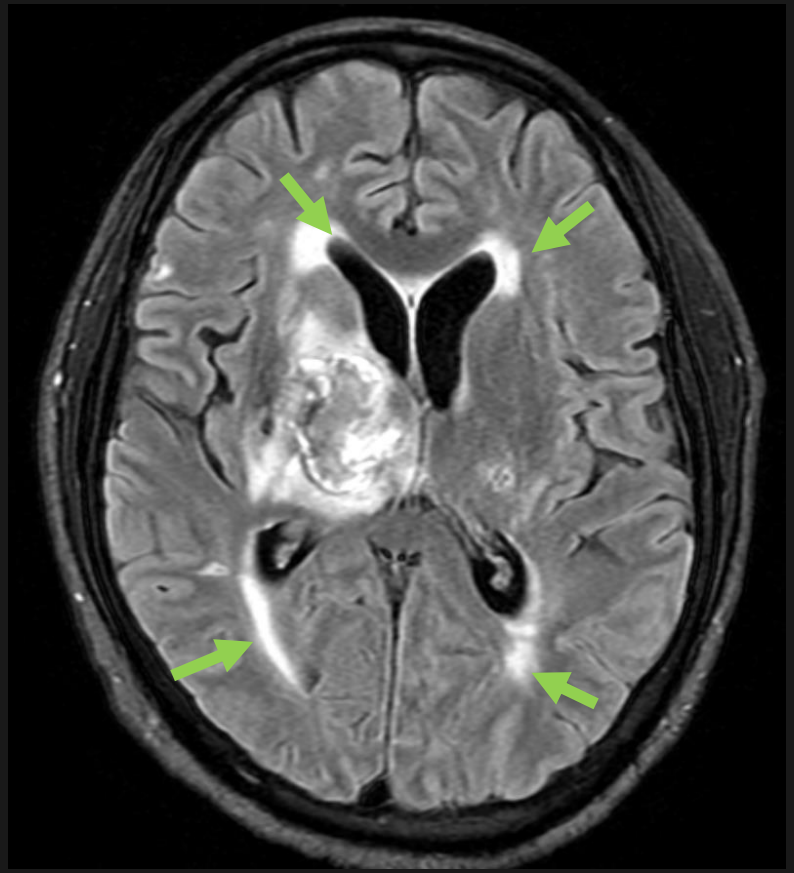


@mixed signal intensity from hematoma surrounding with perifocal edema over right thalamus and corona radiata region

@Suspicious minimal amount IVH and mild hydrocephalus



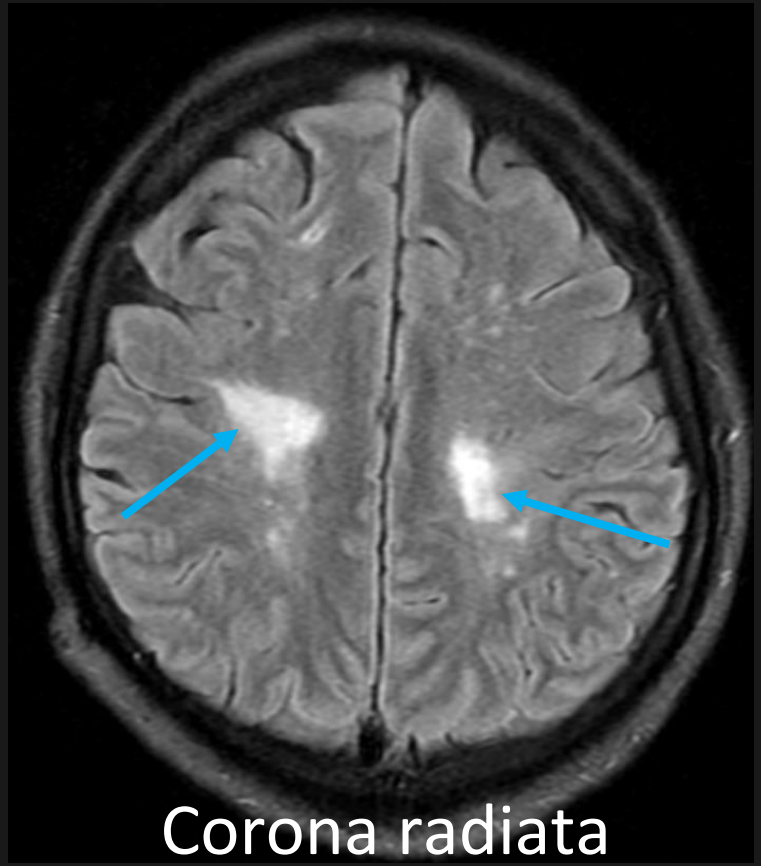
Multiple small hypointensity area on SWAN indicate microbleeding in bilateral lentiform nucleus, left thalamus and pons



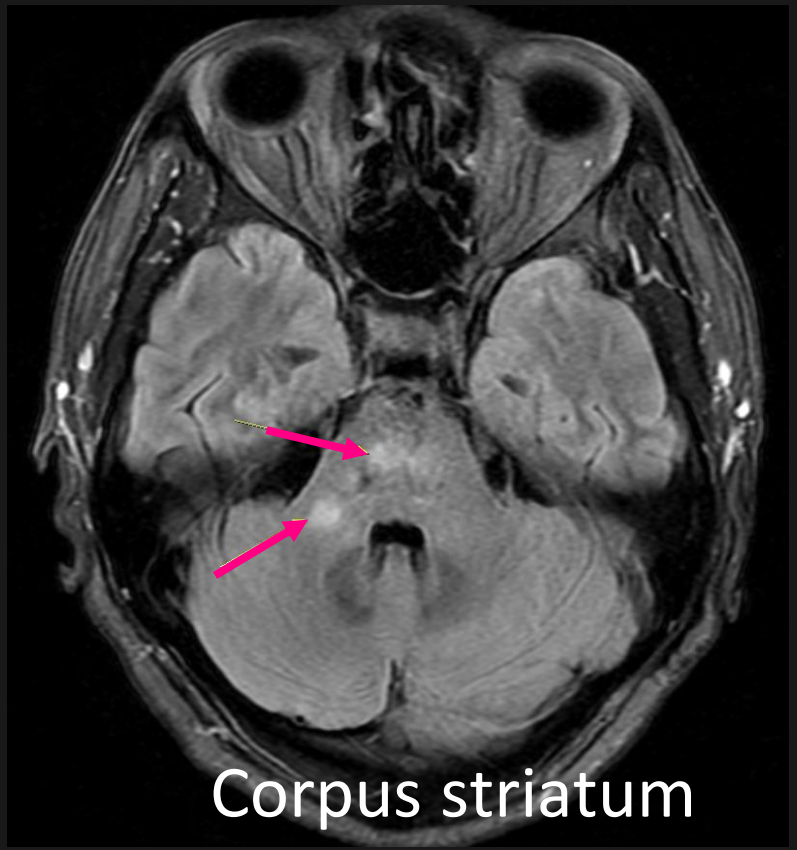
Multiple hyperintensities over subcortical white matter of bilateral frontal-parietal and periventricular region

→**leukoaraiosis** with demyelination or gliosis change

multiple old **lacunar infarct** lesion in

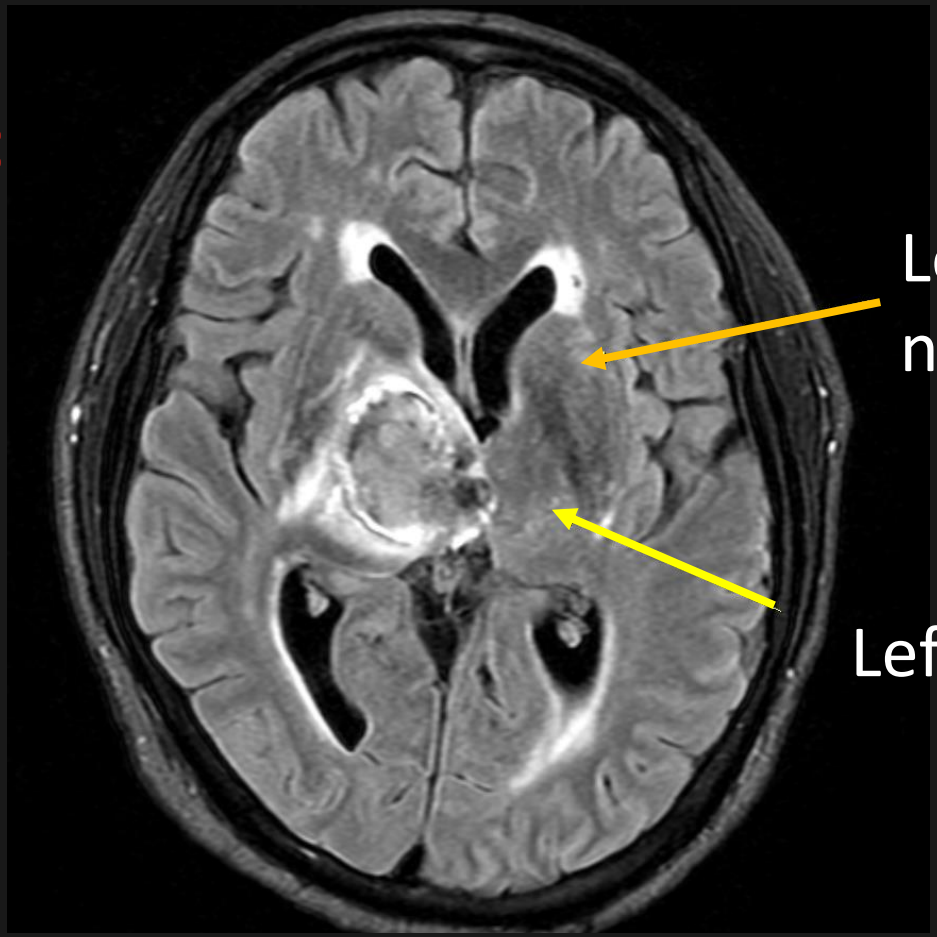


Corona radiata

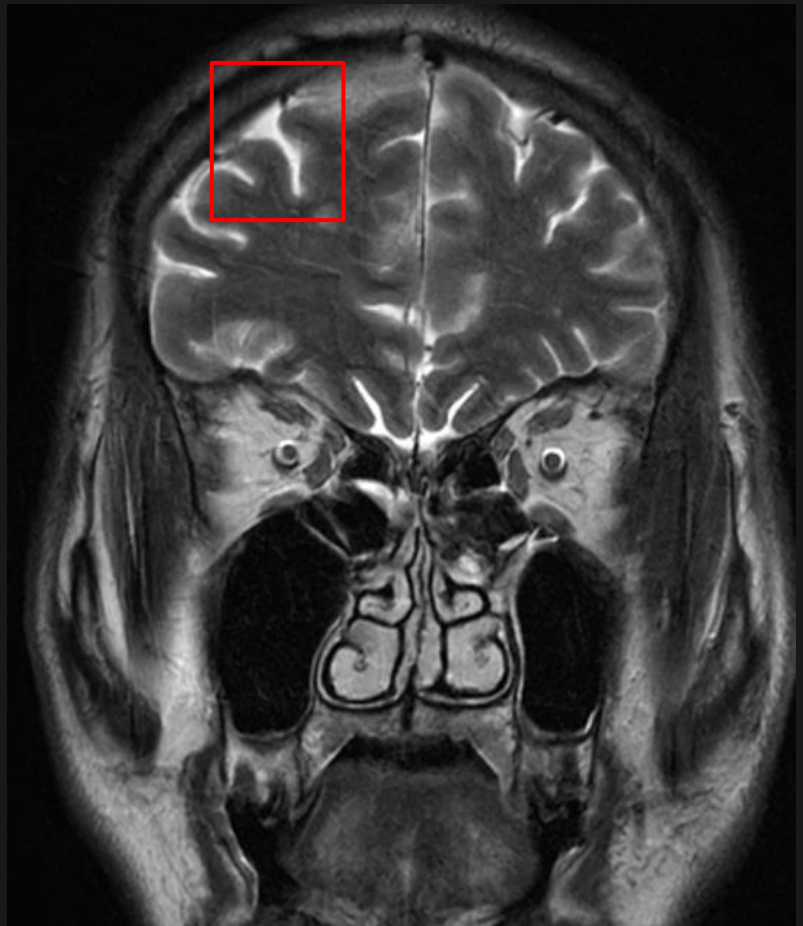


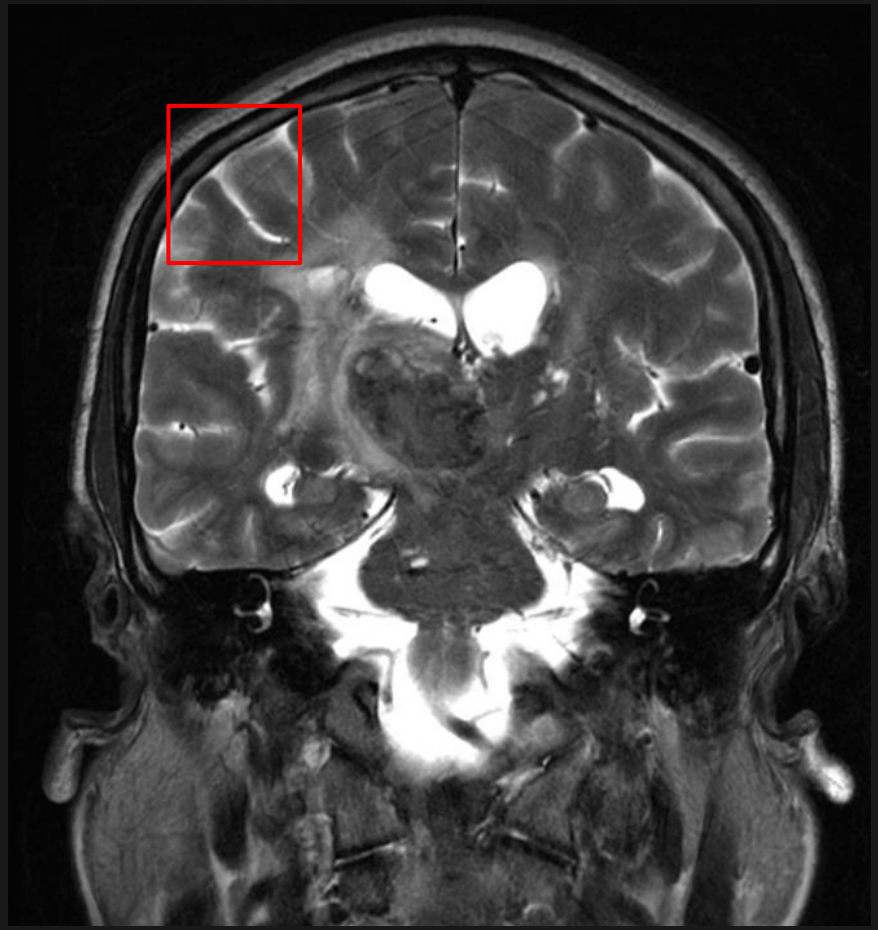
Corpus striatum

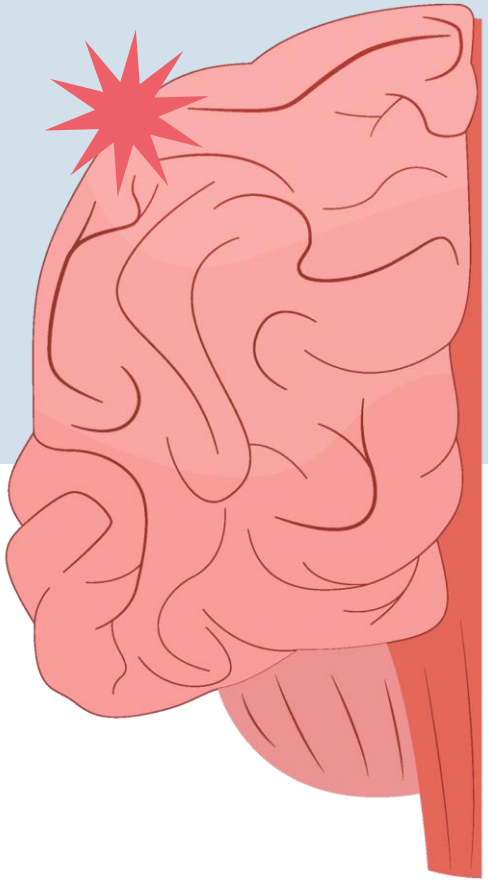
multiple old
lacunar infarct
lesion in



- Focal **brain sulci mild widening** over both frontal-parietal region



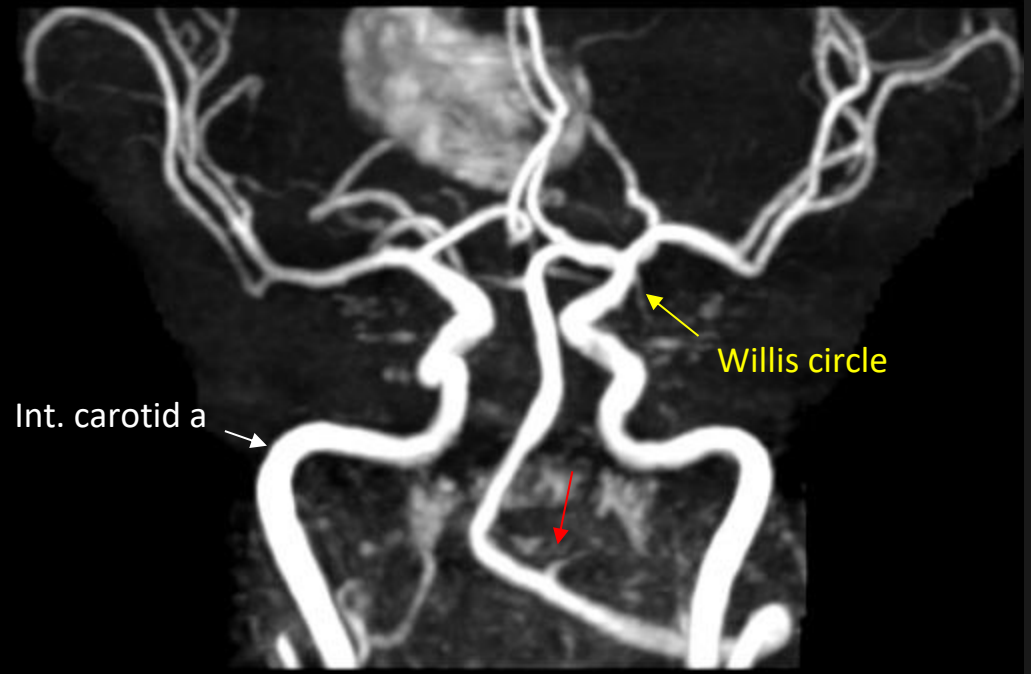




2022-02-05

MRA

- Hypoplasia of distal segment of right intracra nial VA
- no definite evidence of intracranial vascular l esion, the aneurysm formation, and vascular stenosis



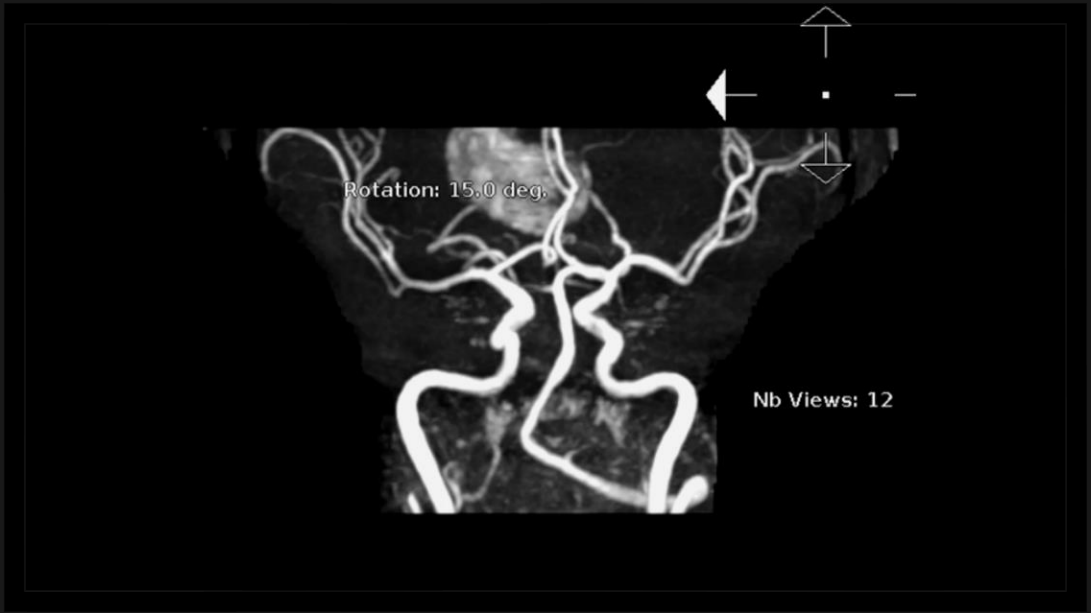
Hypoplasia of distal segment of right intracranial VA

@Vertebral artery hypoplasia (VAH) is a congenital anatomical variation common in healthy asymptomatic individuals.

@Definition: **vessel diameter<2mm** accompanied with lower flow in the posterior cerebral circulation

@VAH may cause markedly lower blood flow in the posterior inferior cerebellar territory and increase the risk of **posterior stroke**

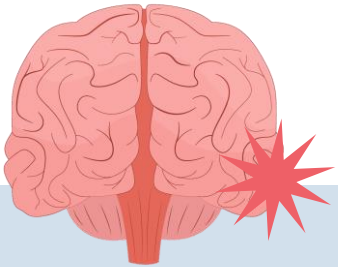
@Prevalence: 15–35% (Miler,2021)



no intracranial vascular lesion, the aneurysm formation, and vascular stenosis

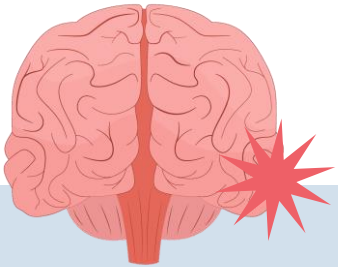
Learning Objectives

- **Hypertensive ICH**- pathology, location, and points of reading image
- **Small vessel disease**- patterns, CADASIL, and case review



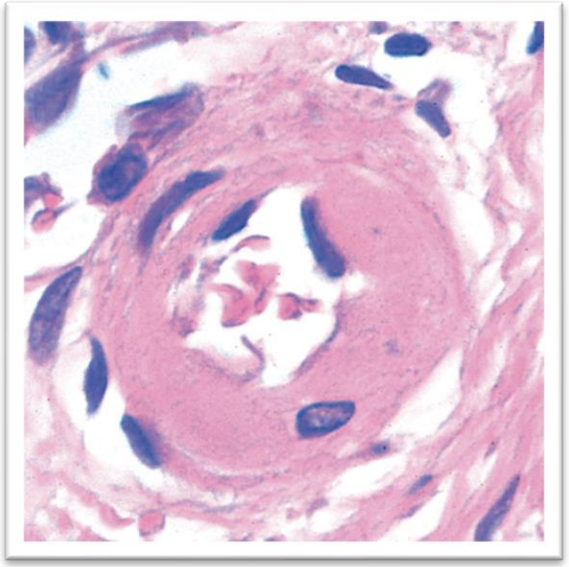
Hypertensive ICH- pathology

- **microaneurysms** of perforating arteries **(Charcot-Bouchard aneurysms)**
  - Diameter: 0.3- 0.9mm
  - occur on small (0.1-0.3 mm) diameter arteries
  - may thrombose, leak, or rupture
- accelerated atherosclerosis: affects larger vessels
- hyaline arteriosclerosis
- hyperplastic arteriosclerosis: seen in very elevated and protracted cases



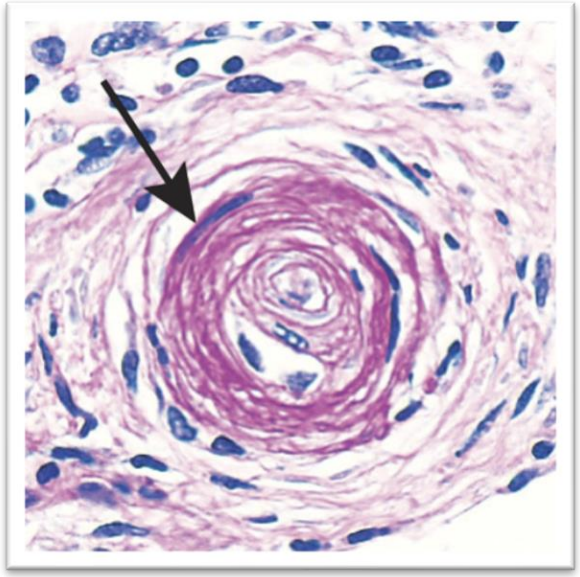
Hypertensive ICH- pathology

(Robbins and Cotran Pathologic Basis of Disease, 10th edition)



Hyaline arteriosclerosis

- older patients
- severe in HTN & DM



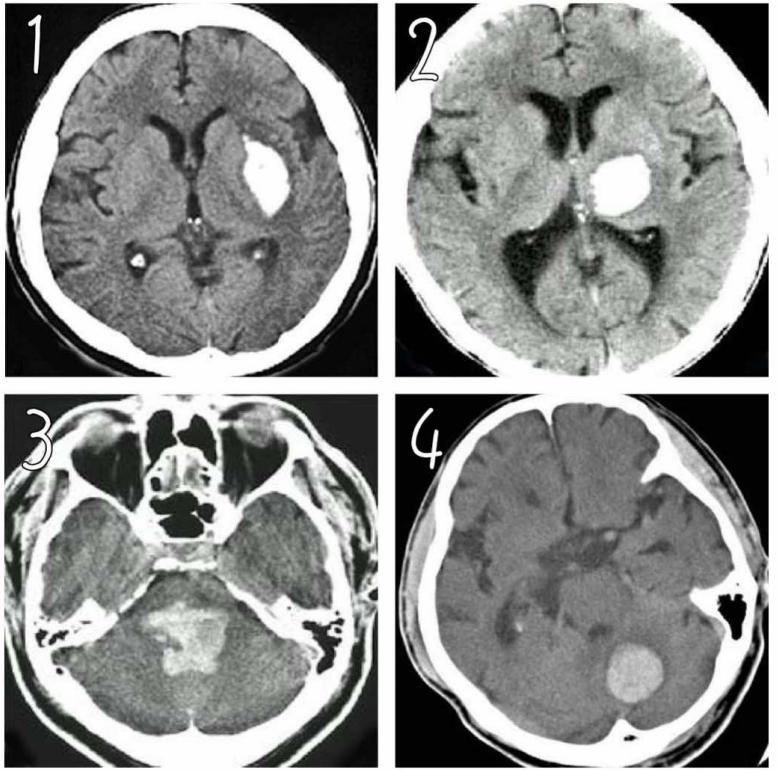
hyperplastic arteriosclerosis

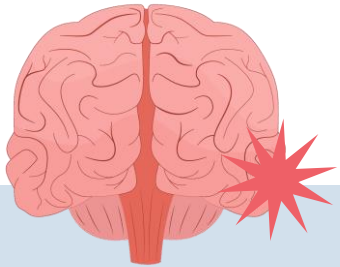
- concentric, laminated (“onion skin”)
- SMCs + thickened BM
- Malignant HTN

Hypertensive ICH- location

Most common location

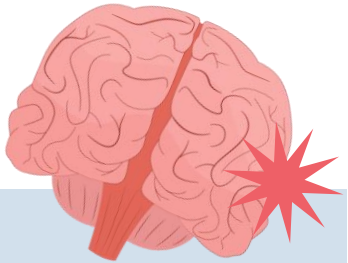
1. Putamen
2. Thalamus
3. Pons
4. cerebellum

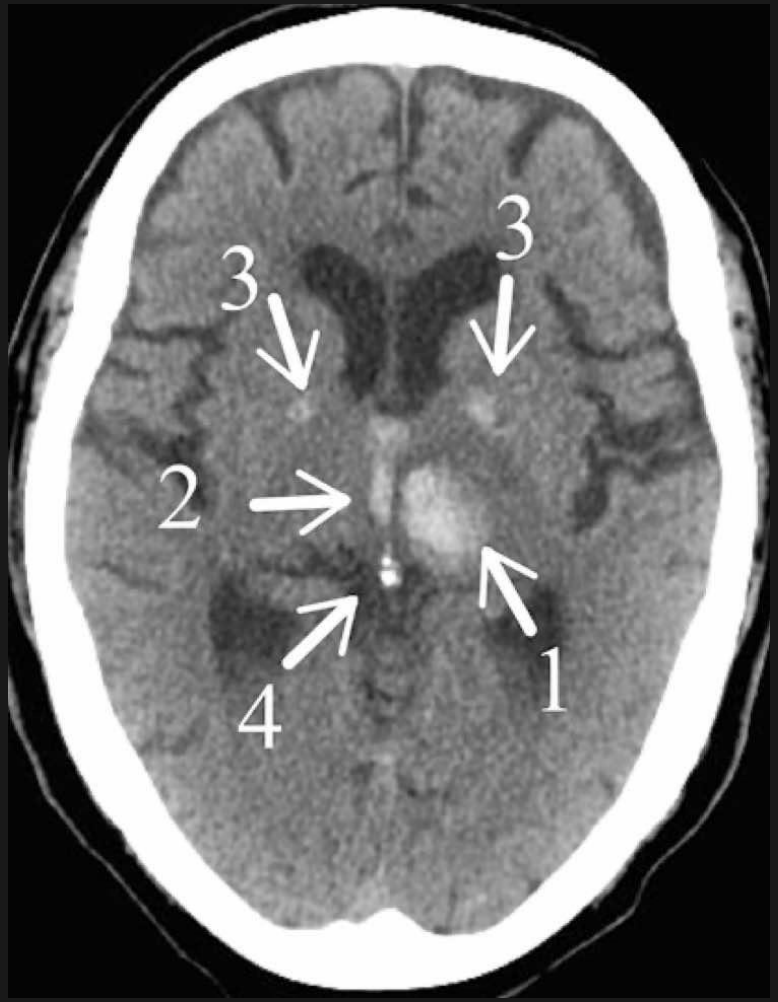




Hypertensive ICH- points of reading CT

- Distinguish **physiological calcification** from hematoma
- The hemaotoma produce mass effect compressing the bleeding small vessels; therefore, the possibility of rebleeding and formation of a bigger hematoma is low
- Location of hematoma in **head injury ICH** and **hypertensive ICH** is different
- Extension into the ventricles ocuurs when the hematoma is **deep** or **large**



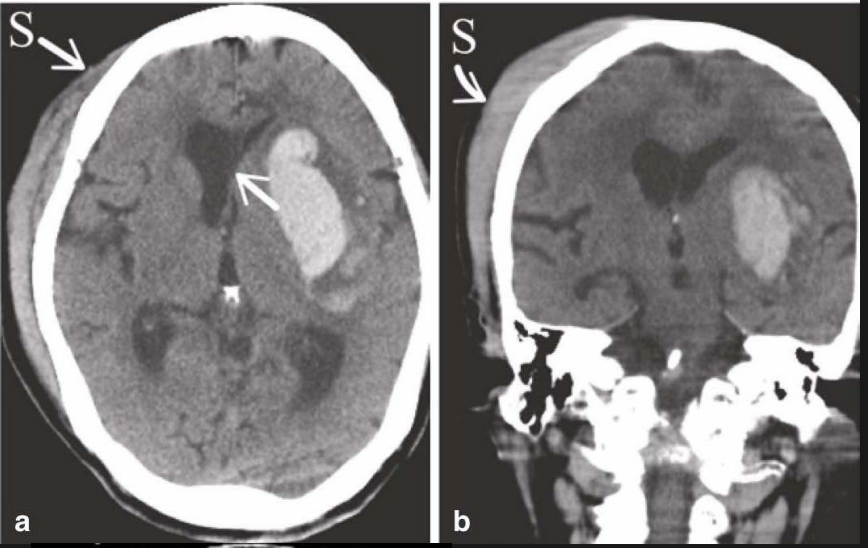


3&4: Physiologically calcification in globus pallidus and pineal gland

@ Physiologically calcification often occurs in globus pallidus, pineal gland, choroid plexus of lateral ventricles, and dentate nuclei and is **bilaterally symmetrical**

1&2: Thalamic hemorrhage ruptures into 3rd ventricle

@ **thalamus** and **caudate nucleus** is deep, so ICH in such location extends into ventricles easily



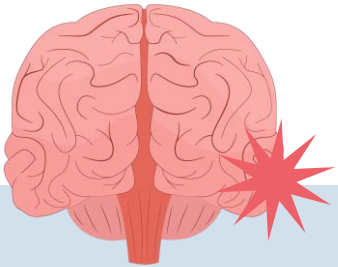
F/83, Fall with **scalp swelling after stroke**. (a) CT, axial; (b) CT, coronal: A big acute hematoma in **left putamen**; the left lateral ventricle is compressed and shrunken (arrow). Although there is a **severe swelling of the scalp** (s) caused by head trauma, **this putaminal hemorrhage cannot be caused by the head trauma, so it can be surmised that she first had a stroke accompanied by limb weakness, causing her to fall**, resulting in head trauma (The same condition in case#38061260)

Head injury causes ICH is always in the **cortex** and combines **brain tissue edema**

Small Vessel Disease- 3 patterns

In MRI, small vessel diseases present three patterns:

- White matter **hyperintensities**, which are **leukoaraiosis**
- **Lacunes**(3 to 15 mm) and containing water in MRI, including **old lacunar infarcts** , **old small hemorrhage** (microbleed), and **dilated perivascular space**
- **Microbleeds**

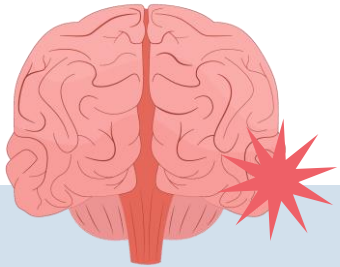


Leukoaraiosis- pathology

- **hypertension** and **atherosclerosis** in the **small blood vessels**

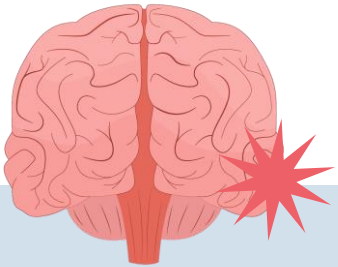
→vascular endothelial changes and stenosis
→ reduces the blood flow
→ brain tissue ischemia and BBB breakdown
→ toxic substances of the plasma component flow into the brain tissue
→ **leukoaraiosis**

- The **lacunar infarct** is also caused by the occlusion of small perforating vessels → **lacunar infarct often coexists with leukoaraiosis**



Leukoaraiosis- CT imaging

- Mild **hypodense** on CT
- CT shows leukoaraiosis around the ventricles called **PVL (Periventricular lucency)**
- For leukoaraiosis of **deep white matter**, CT can only detect **confluent leukoaraiosis** or **severe individual leukoaraiosis**

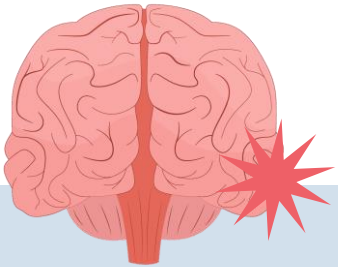


Leukoaraiosis- MRI imaging

- T2WI and FLAIR: **hyperintensity**
- Attenuated CSF signal on FLAIR→ even a small lesion is definite
- Differential diagnosis with **acute infarction**

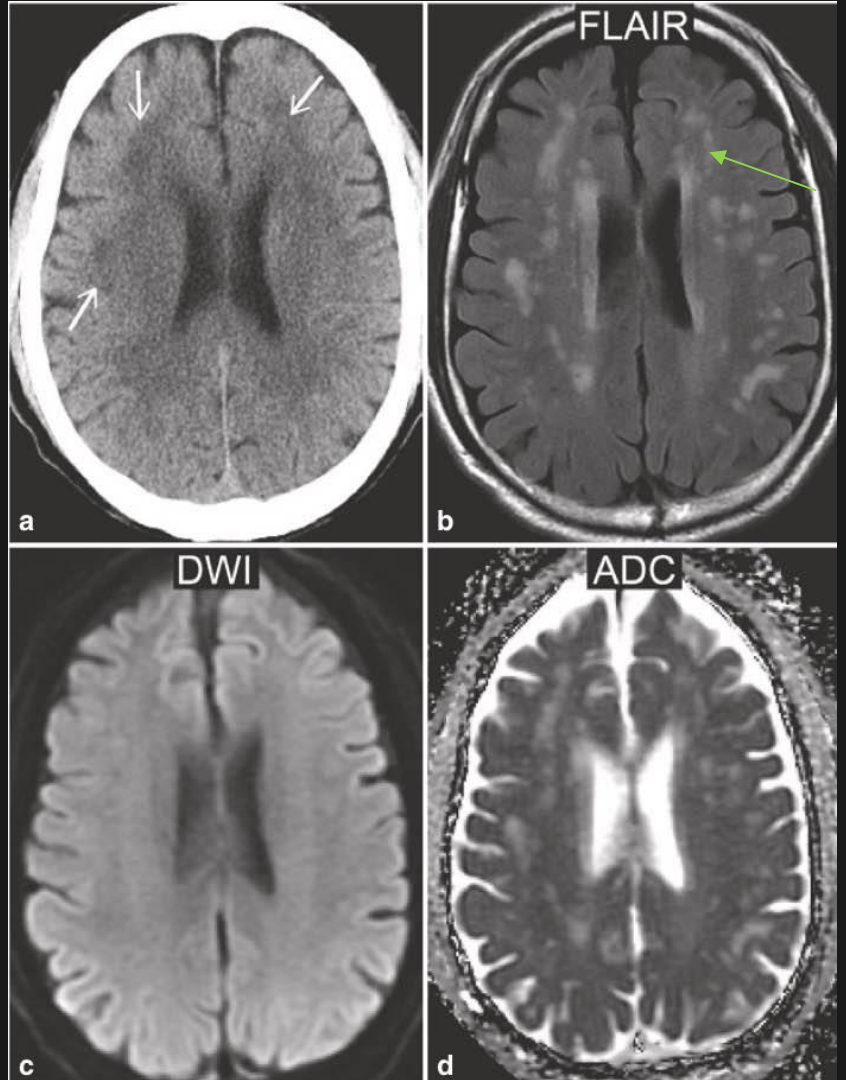
DWI

- No signal change → **Leukoaraiosis**
- **Hyperintensity** with restricted diffusion → **Acute infarction**



Mild hypodensity in the bilateral centrum semiovale (CT)

No signal change on DWI→ r/o acute infarction



Hyperintensity lesion (FLAIR is the best pulse sequence to show leukoaraiosis)

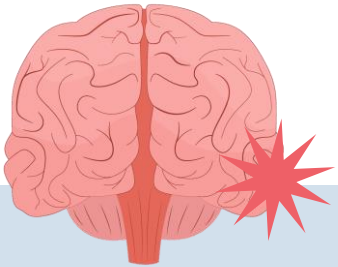
Microbleeds- introduction

- Epidemiology

1. cerebral microbleeds in the **elderly** can reach **11.1–23.5%**
2. often occurs in patients with **uncontrollable hypertension**

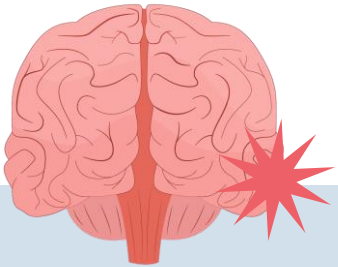
- include two types of vascular diseases

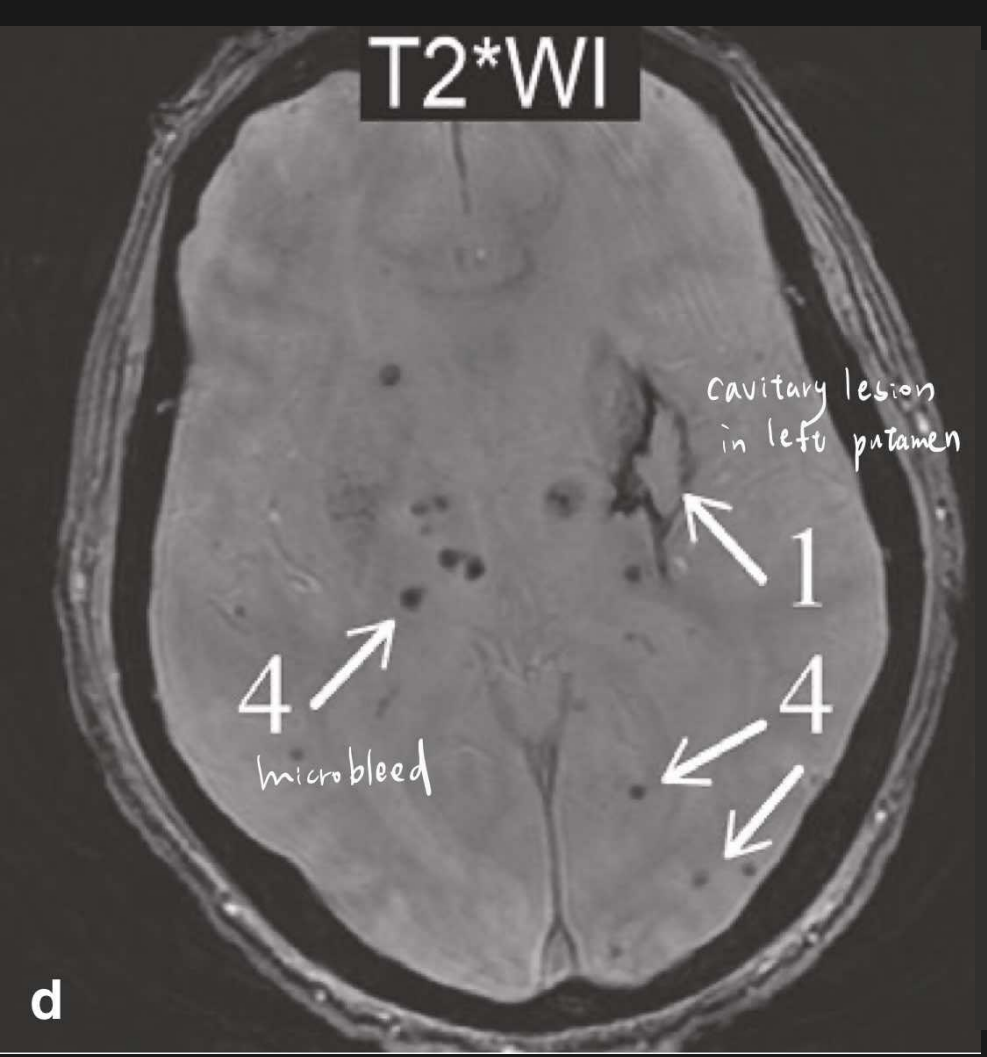
1. **Hypertensive vasculopathy**: mostly located in the **basal ganglia, thalamus, brain stem, and cerebellum**
2. **Amyloid angiopathy:** mostly in the **cerebral cortex,** prone to hemorrhage → real hemorrhagic stroke

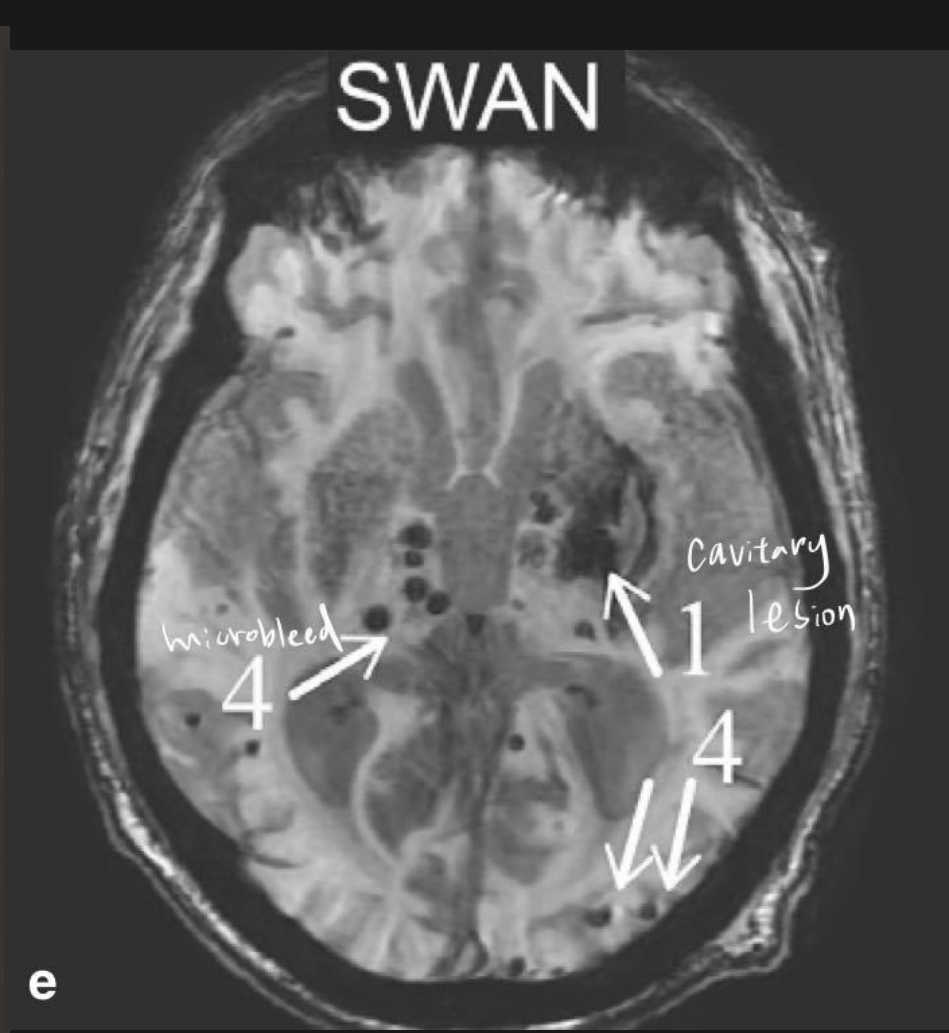


Microbleeds- imaging

- CT: not easy to detect
- **MRI T2∗WI, SWI, and SWAN** are sensitive to **hemosiderin deposition ∴** are the best pulse sequences in diagnosing the microbleeds



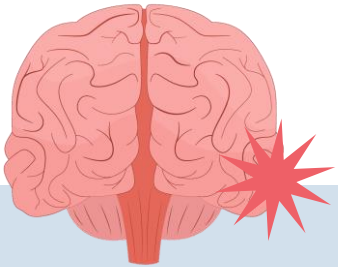

T2*WI
cavitary lesion in left putamen
1
4
4
4
microbleed
d


SWAN
microbleed
4
cavitary lesion
1
4
e

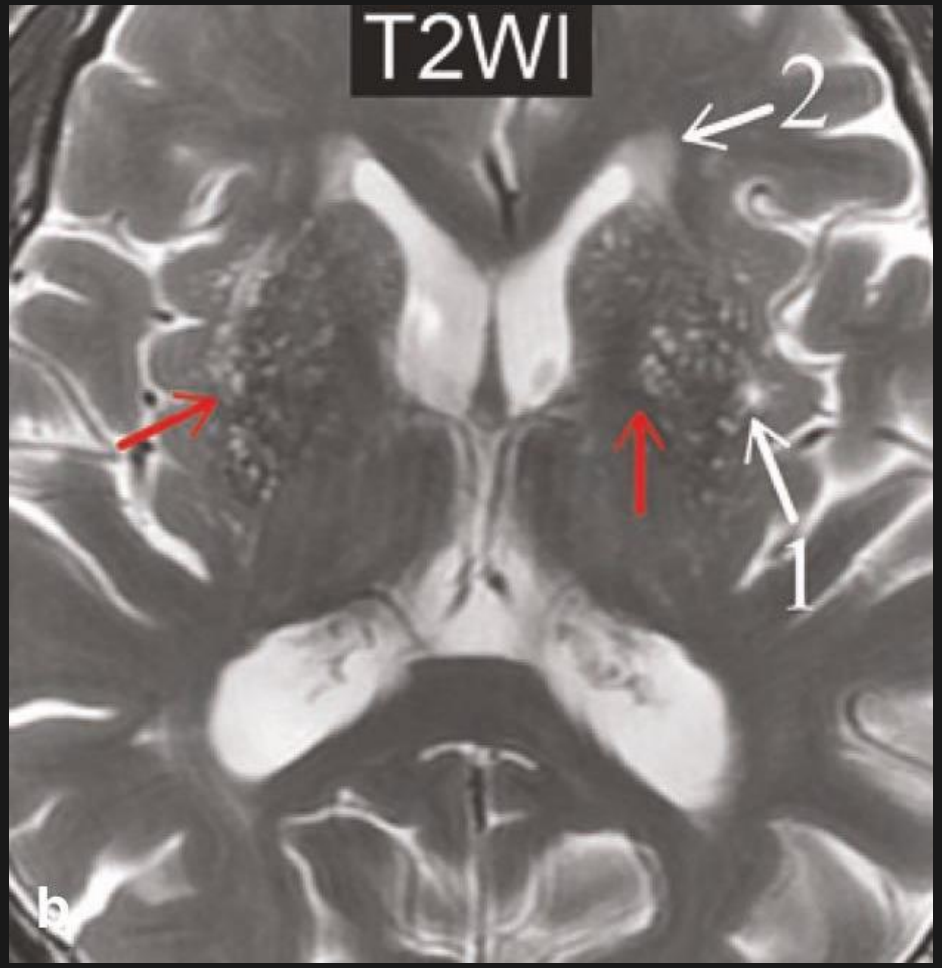
Dilated Virchow–Robin(perivascular) Space

- difficult to distinguish from **old lacunar infarction** in CT
- contains **CSF** → the signal changes are consistent with CSF → east to distinguish in **MRI**
- **État criblé** (status cribrosum)

1. describes the **diffusely widened perivascular spaces** (Virchow-Robin spaces) in the **basal ganglia**, especially in the corpus striatum on MRI
2. usually symmetrical
3. showing **CSF signal** on all sequences

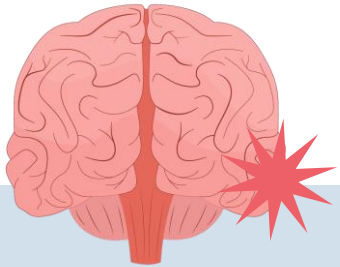


Virchow- Robin space(white as CSF in the ventricles)



CADASIL(Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy)

- Caused by abnormal mutations in a single chromosome **(NOTCH3)**
- Occurs mostly in the age of **40–50 years**
- Poses no risks of hypertension, diabetes, high blood lipids…
- Symptoms: minor stroke, gradual intelligence and memory decline
- Family disease history

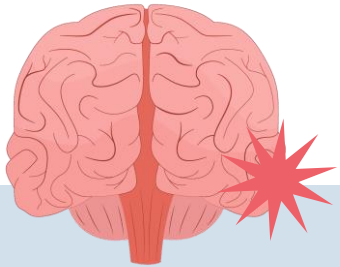


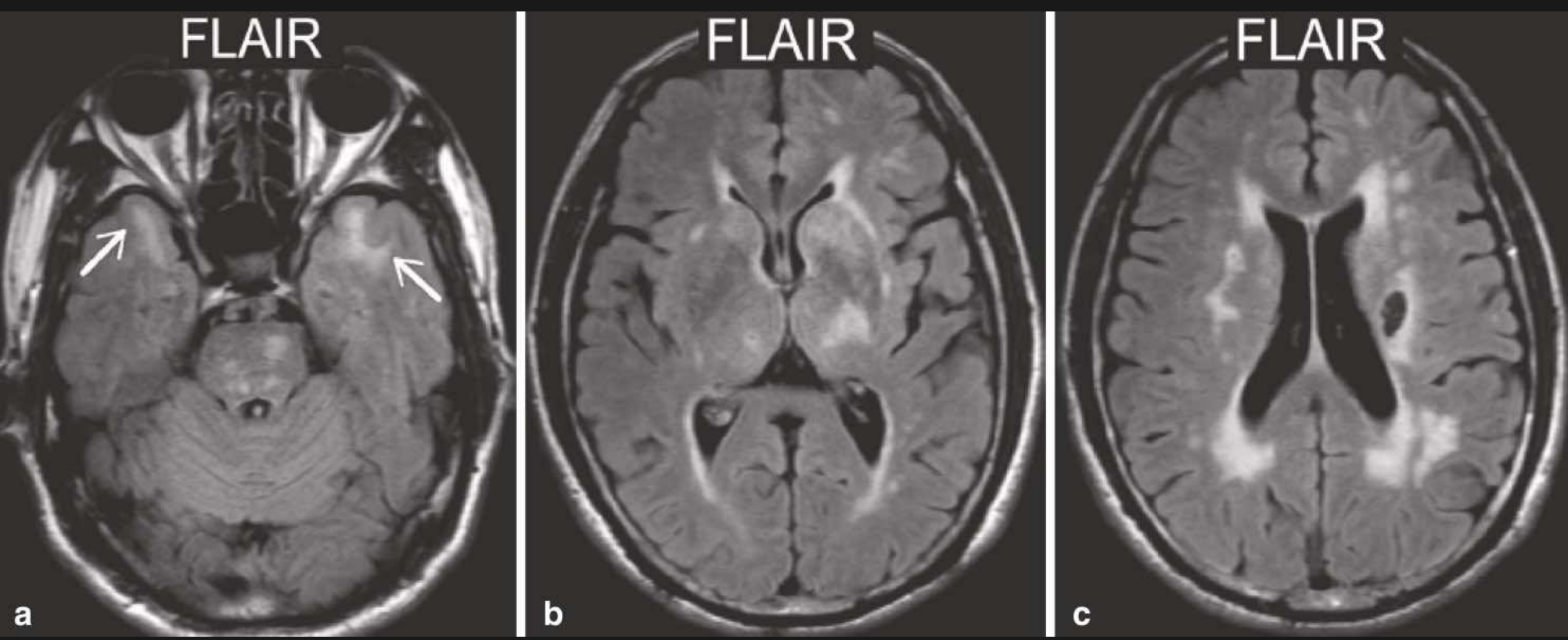
CADASIL(Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy)

- 3 common cerebral small vessel diseases in MRI

1. **leukoaraiosis**, especially in **anterior temporal lobe** (a unique sign)
2. **lacunar infarcts**
3. **microbleeds**

- White matter hyperintensities can also be found in the periventricular brain tissue, deep white matter, and brain stem

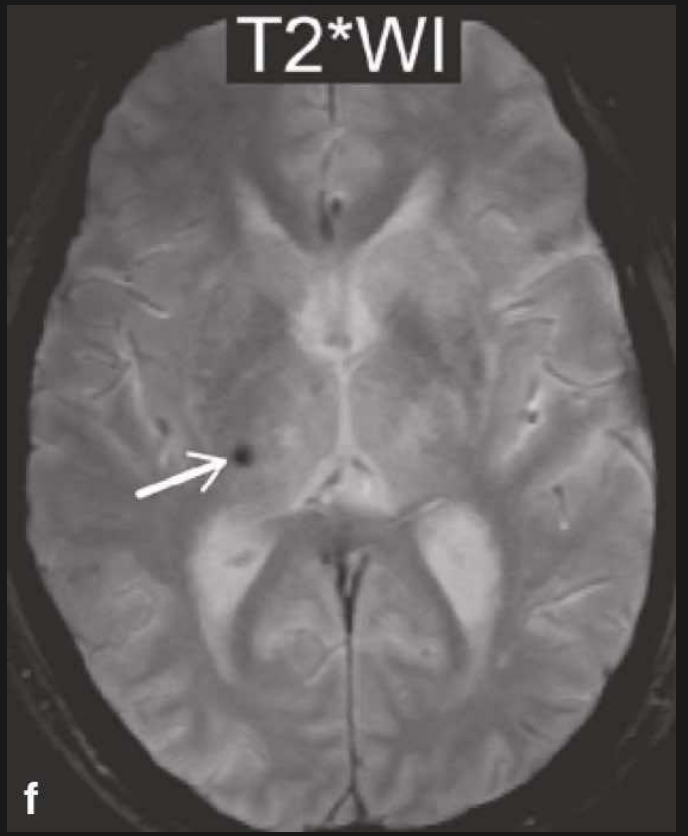




Leukoaraiosis in **anterior temporal lobe** is especially specific for CADASIL

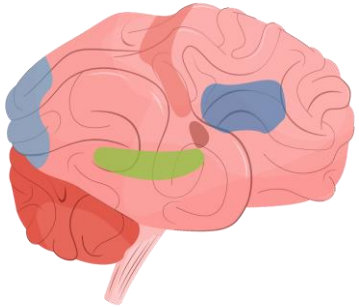
Leukoaraiosis
(hyperintense lesion)

Lacune(1.5 cm) in the left corona radiata



Microbleed in right thalamus

Reference



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