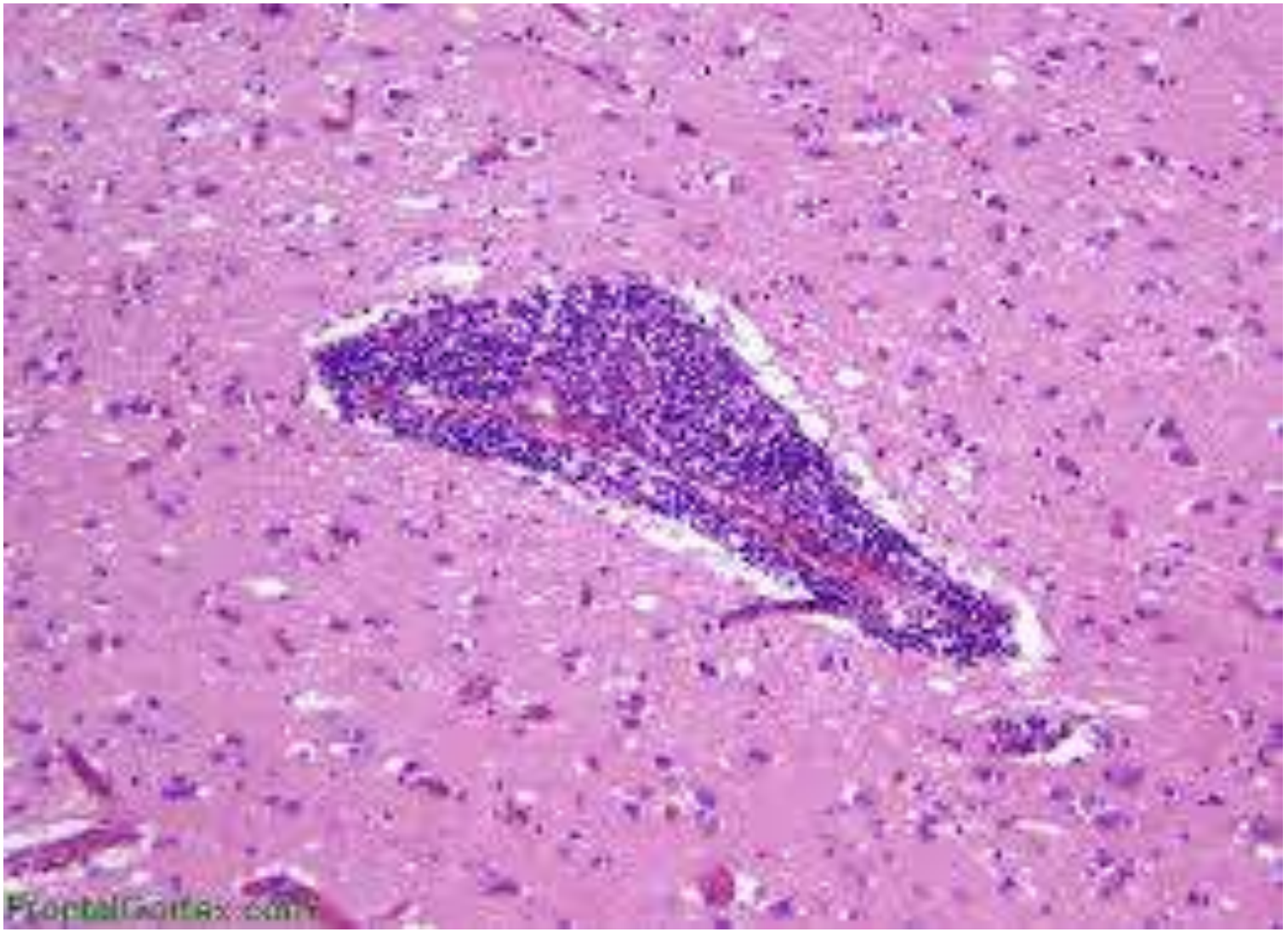
Cerebrovascular diseases-2

Primary angiitis of CNS



- Other causes of infarction

i. Hypercoagulable states

ii. Drug-abuse such as amphetamine, heroin and cocain

Note

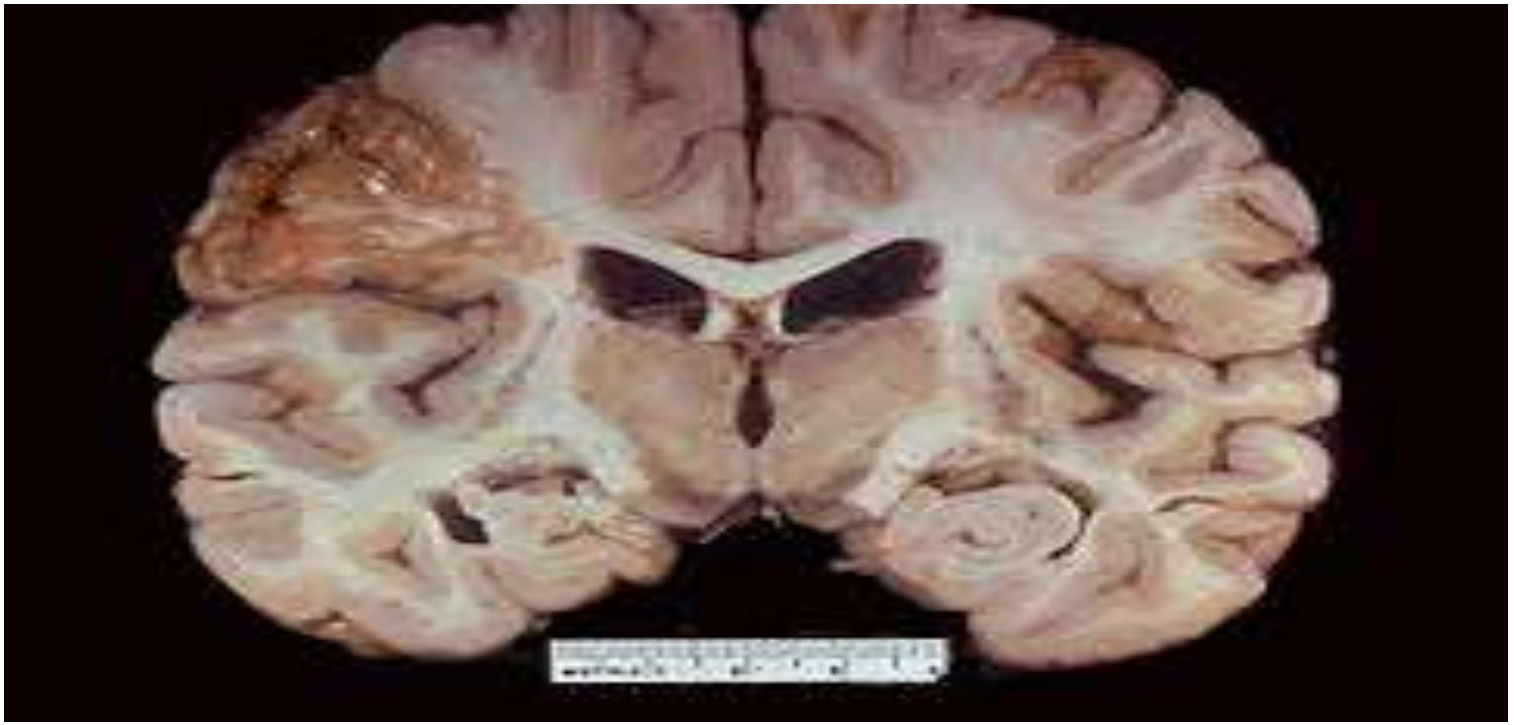
- The venous side of the circulation may also undergo thrombosis and cause significant cerebral ischemia
- The striking example is the thrombosis of the superior sagittal sinus which can occur with infections or hypercoagulability state

Morphology of focal cerebral ischemia

- *The macroscopic appearance changes in time.*

1. During the first 6 hours of irreversible injury, little is observed
2. By 48 hours

- The tissue becomes pale, and swollen, as a result of edema



3. From 2 to 10 days

- The brain becomes gelatinous and friable,

4. From 10 days to 3 weeks

- The tissue liquefies, leaving a fluid-filled cavity which represents liquifactive necrosis

Microscopically,

1. After the first 12 hours:

a. Red neurons with edema

b. Disintegration and myelinated fibers .

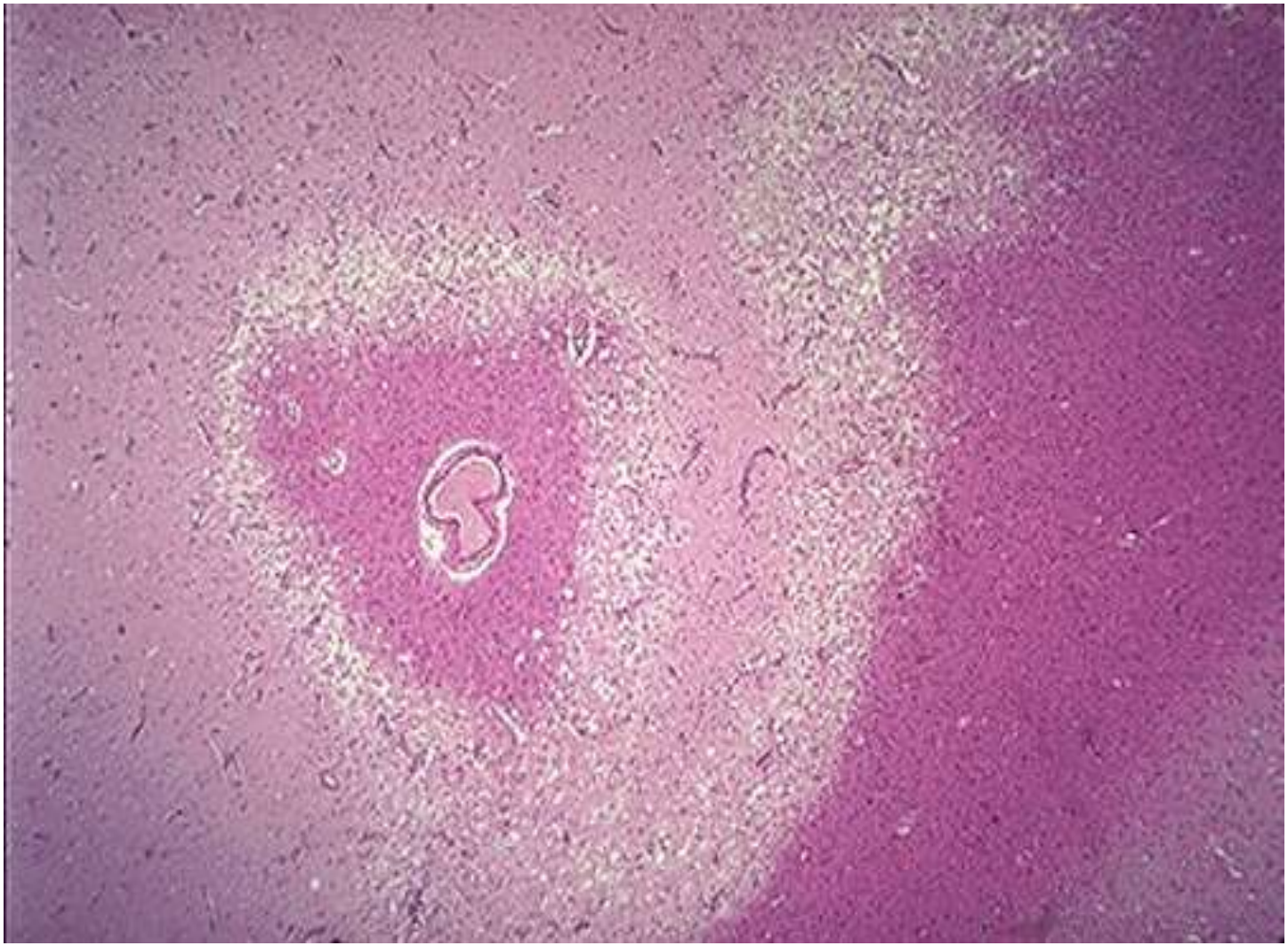
2. Up to 48 hours, there is some neutrophilic emigration

3. 2-3 weeks

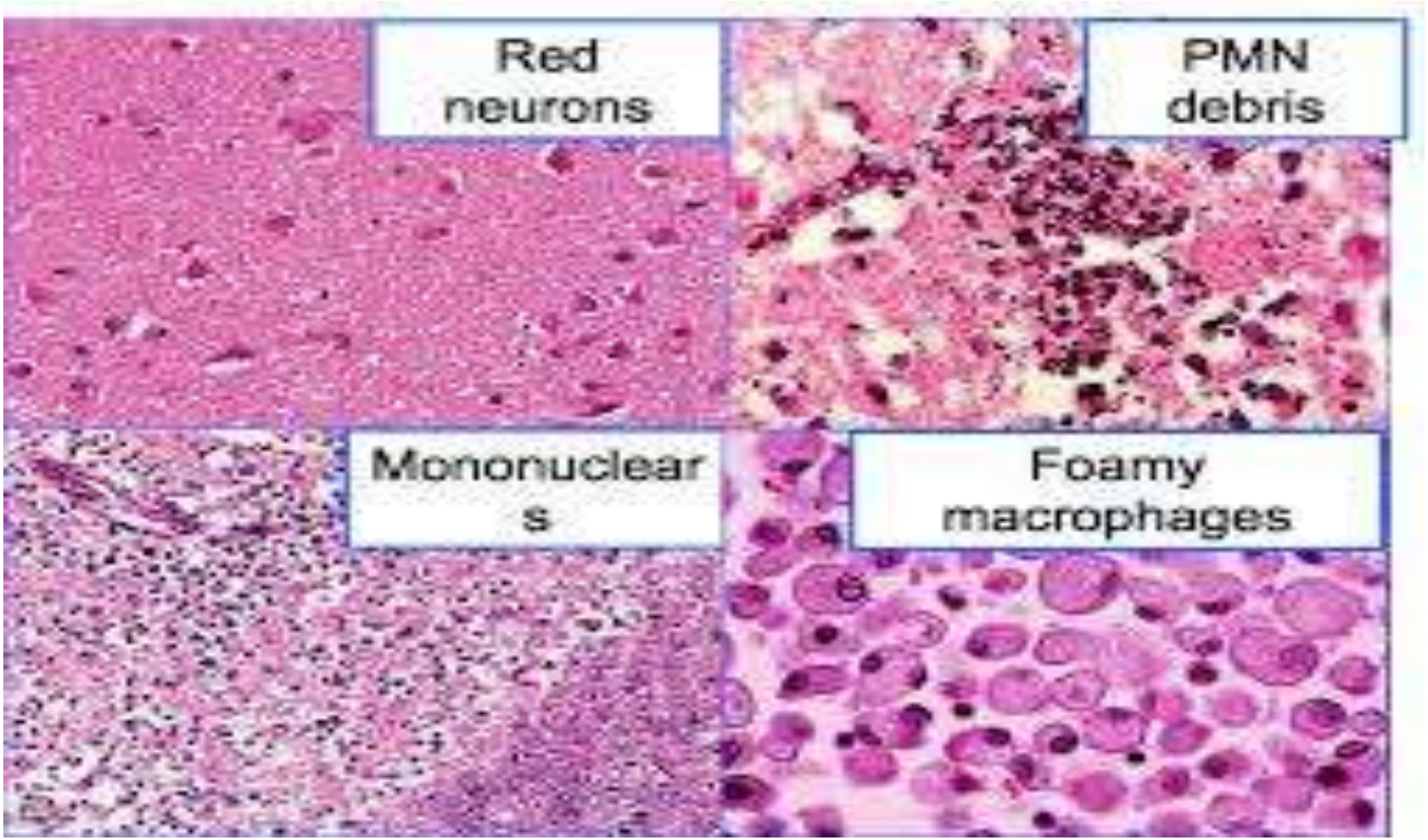
a. Mononuclear phagocytic cells predominate and macrophages containing myelin breakdown products or blood may persist in the lesion for months to years.

b. Gemistocytic gliosis followed by fibrillary astrocytosis after several months

Edema in infarction



Microscopic changes in infarction



Notes:

a. In the cerebral cortex the cavity is delimited from the meninges and subarachnoid space by a gliotic layer of tissue, derived from the molecular layer of cortex.

b- The pia and arachnoid are not affected and do not contribute to the healing process.

B. Hypertensive cerebrovascular diseases

Effect of hypertension on the brain include:

1. Lacunar infarcts
2. Slit hemorrhages
3. Hypertensive encephalopathy
4. Massive hypertensive intraparenchymal hemorrhage

1. Lacunes or *lacunar infarcts* :

Mechanism

- Hypertension causes arteriolosclerosis of the deep penetrating arteries and arterioles that supply the basal ganglia, hemispheric white matter and brain stem

- This arteriolosclerosis sclerosis leads to occlusion of these vessels
- The result is development of lake-like spaces defined as less than 15 mm wide
- Occur mainly in the

i. Lenticular nucleus

ii. Thalamus

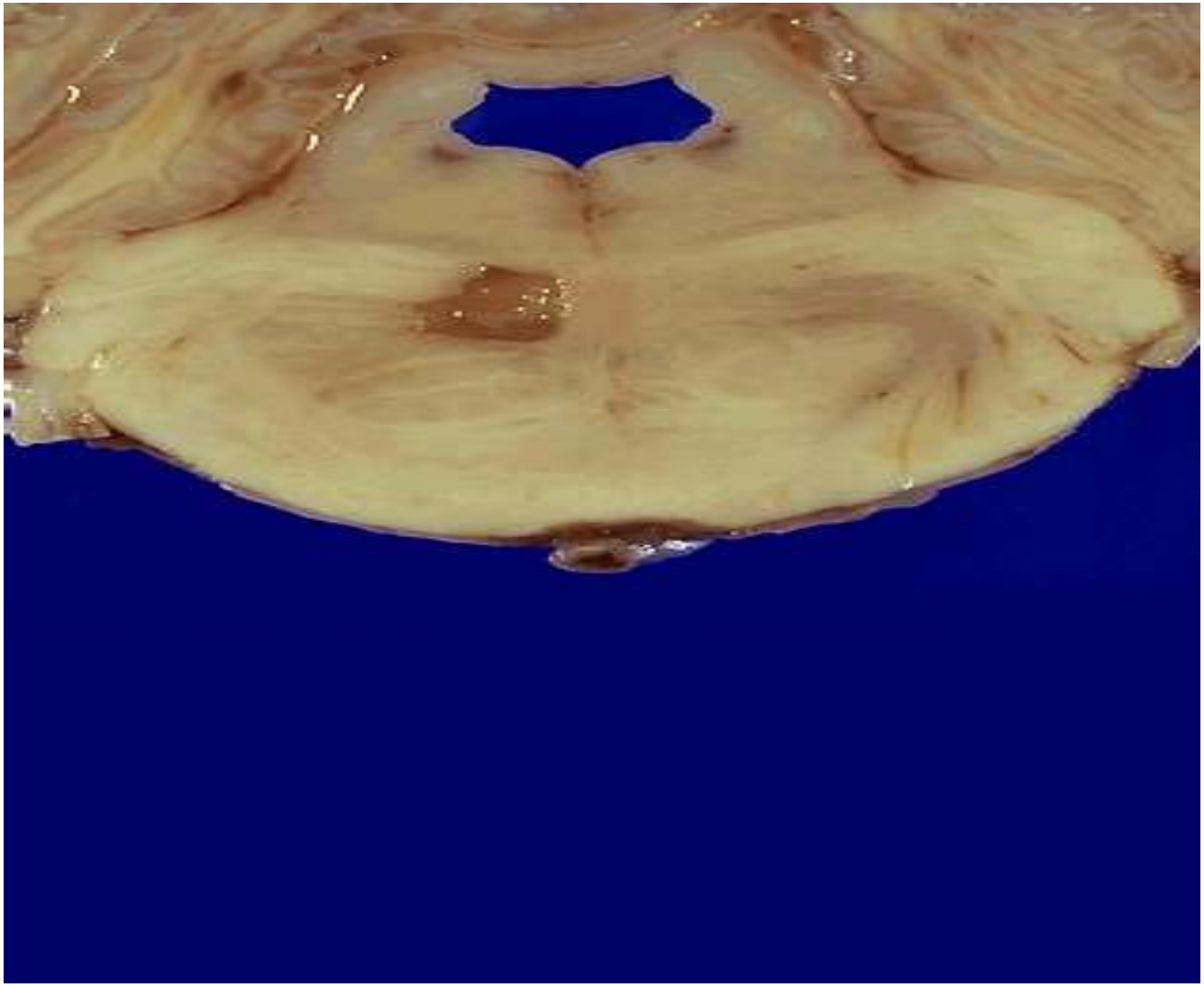
iii. Internal capsule

iv. Caudate nucleus

v. Pons

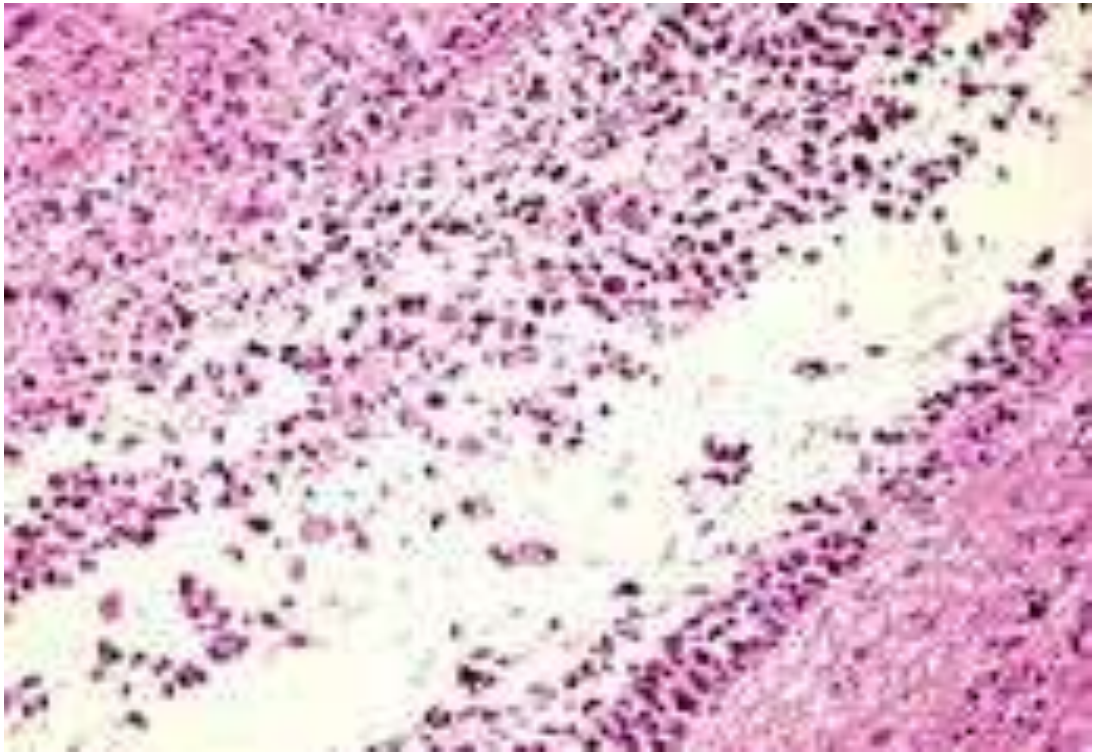
- In descending order of frequency

Lacunar infarct in the Pons



2. Slit hemorrhages;

- Hypertension can lead to rupture of the small caliber blood vessels and lead to development of small hemorrhages
- With time these hemorrhages resorb leaving behind a slit-like spaces called slit hemorrhages



-Microscopically characterized by

i. Focal tissue destruction

ii. Pigment-laden macrophages

iii. Gliosis

3. Hypertensive encephalopathy

- Is a clinico pathologic syndrome arising in the setting of malignant hypertension
- Most often is associated with sudden sustained rises in diastolic blood pressure to greater than 130 mm Hg and characterized

a. By increased intracranial pressure due to loss of autoregulation and forcefull overdistention of blood vessels, leading to fluid extravasation (hydrostatic edema)

b Global cerebral dysfunction, manifesting as headaches, confusion, vomiting, convulsions, and sometimes coma.

- Rapid therapeutic intervention to reduce the intracranial pressure is essential.because this syndrome does not remit spontaneously

- Postmorteum examination shows edematous brain with or without trantentorial or tonsillar herniations
- Microscopic examination shows

a. Fibrinoid necrosis and thrombosis of arterioles and capillaries

b. and microinfarcts and microhemorrhages Microscopic examination shows

C. Intracranial Hemorrhage

- May occur at any site within the CNS either

1. Intraparenchymal hemorrhage

Causes

a. Hypertension
b. Amyloid angiopathy

2. Subarachnoid hemorrhages:

- Are most commonly seen with aneurysms but occur also with other vascular malformations.

3. Hemorrhages associated with the dura (in either subdural or epidural spaces) usually due to *trauma.*

1. Intraparenchymal hemorrhages

- Rupture of a small intraparenchymal vessel can lead to intraparenchymal hemorrhage and this condition is called hemorrhagic stroke

- Spontaneous non traumatic brain hemorrhage occur most commonly in the middle to late adult life
- The peak incidence is at about 60 years

- Is divided into

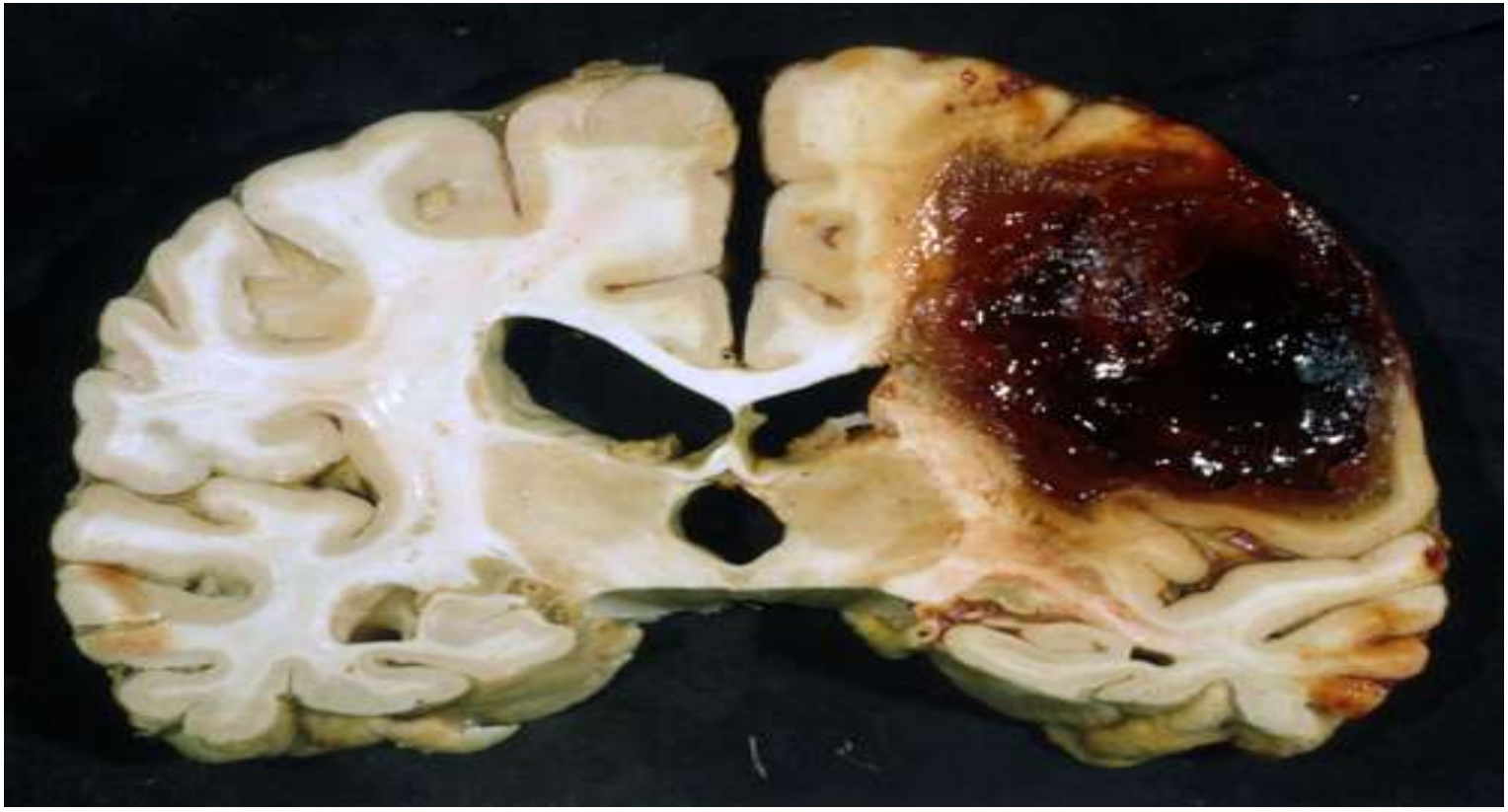
i. Ganglionic hemorrhages

- Occur in the basal ganglia and thalamus
- Mainly caused by hypertension

ii. Lobar hemorrhages

- In the cerebral hemispheres
- Main cause by cerebral amyloid angiopathy

Lobar intraparenchymal hemorrhages



- Other causes of intraparenchymal hemorrhages

i. Systemic coagulation disorder

ii. Neoplasms

a. Primary brain tumors mainly glioblastoma and oligodendroglioma

b. Metastatic tumors to brain mainly melanoma and renal cell carcinomaiv.

iii. Vascular malformations

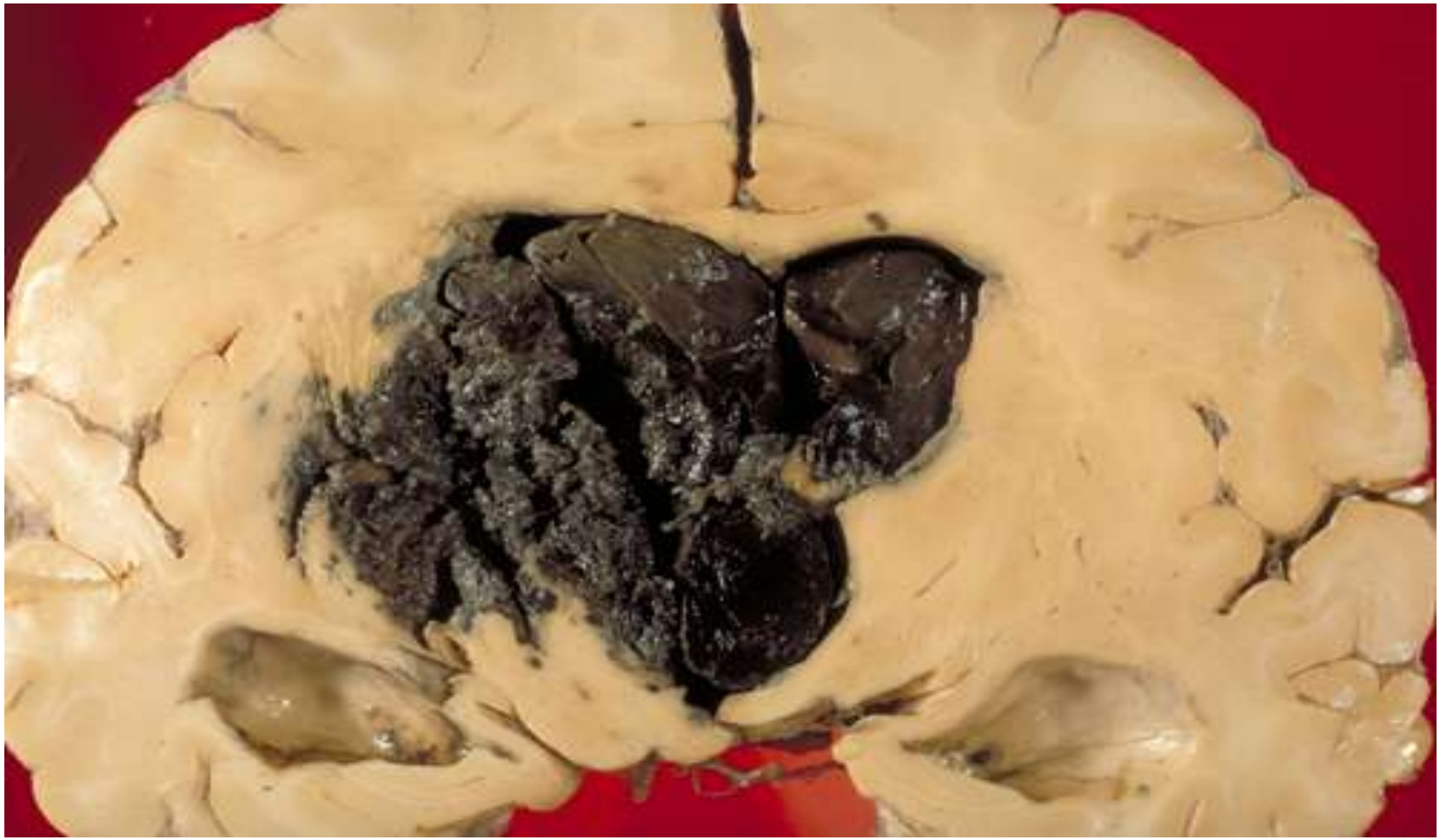
Hypertensive hemorrhages

- Hypertension is the risk factor for deep brain parenchymal hemorrhages
- Accounts for more than 50% of clinically significant brain hemorrhages
- It accounts for about 15% of deaths among individuals with hypertension

- Sites

i. Putamen in 50-60% of the case
ii. Thalamus
iii. Pons
iv. cerebellum

Basal ganglia hemorrhage



Mechanisms of massive hemorrhage in Hypertension:

1. Hyaline arteriolar sclerosis

- Affects the deep penetrating arteries and arterioles that supply the basal ganglia and the brain stem
- Affected arteriolar walls are weakened and are more vulnerable to rupture.

2. Chronic hypertension results in formation of minute aneurysms (*Charcot-Bouchard microaneurysms)*

- Mainly occurs in the basal ganglia

- Form in vessels less than 300 μm in diameter

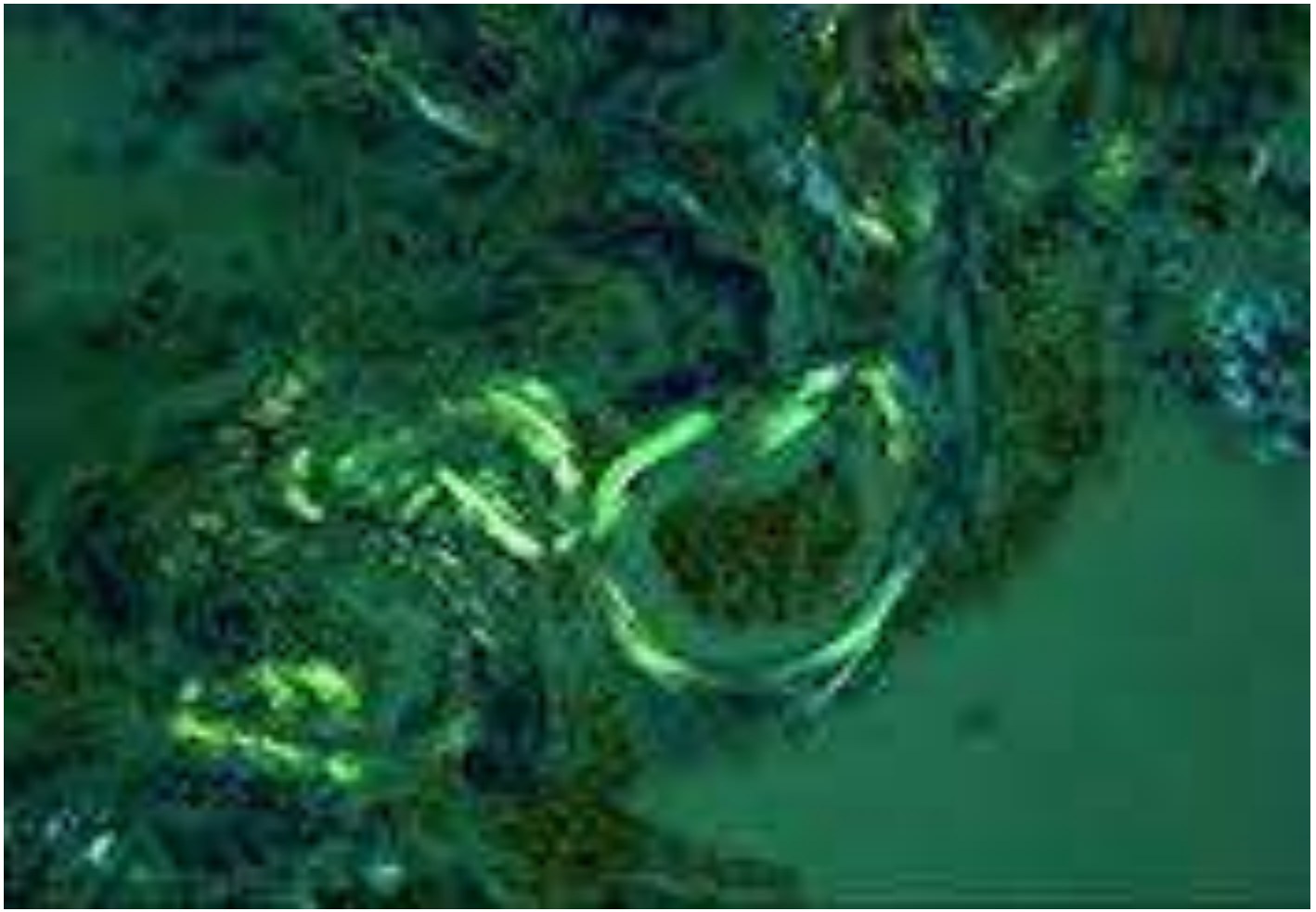
Cerebral Amyloid Angiopathy (CAA) :

- Is the risk factor most commonly associated with lobar hemorrhages
- In CAA, amyloidogenic peptides usally the same ones in Alzheimer diseases ((Aβ amyloid) are deposited in the walls of medium-small caliber menigeal and cortical vessel

- This deposition can weaken the vessel wall and lead to hemorrhage

Morphology

- The underlying vascular abnormality in CAA is typically restricted to the leptomeningeal and cerebral cortical arteioles and capillaries



Subarachnoid Hemorrhage

Causes:

A. Saccular (berry) aneurysm rupture

- Is the most frequent cause of clinically significant subarachnoid hemorrhage

B. Vascular malformation

C. Trauma

D. Rupture of intraparenchymal hemorrhages into the ventricles

1. Berry (saccular) aneurysms

- Rupture of berry aneurysms is the most frequent cause of clinically significant subarachnoid hemorrhage

- Saccular aneurysm is the most common type of intracranial aneurysms
- Other types of aneurysms include:

1. Atherosclerotic aneurysm , mostly of the basilar artery

2. Mycotic aneurysms
3. Traumatic aneurysms
4. Dissecting aneurysms

Note: Mycotic, traumatic and dissecting aneurysms

1. Arise in the anterior circulation
2. Cause infarction rather than hemorrhage