



PATHOLOGY

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▼ **Without treatment, recurring bleeding is common in survivors & prognosis worsens with each episode of bleeding.**

▶ **90%** of saccular aneurysms occur in the **anterior** circulation near major arterial branch points (F23-9); **multiple aneurysms** exist in **20% to 30% of cases.**

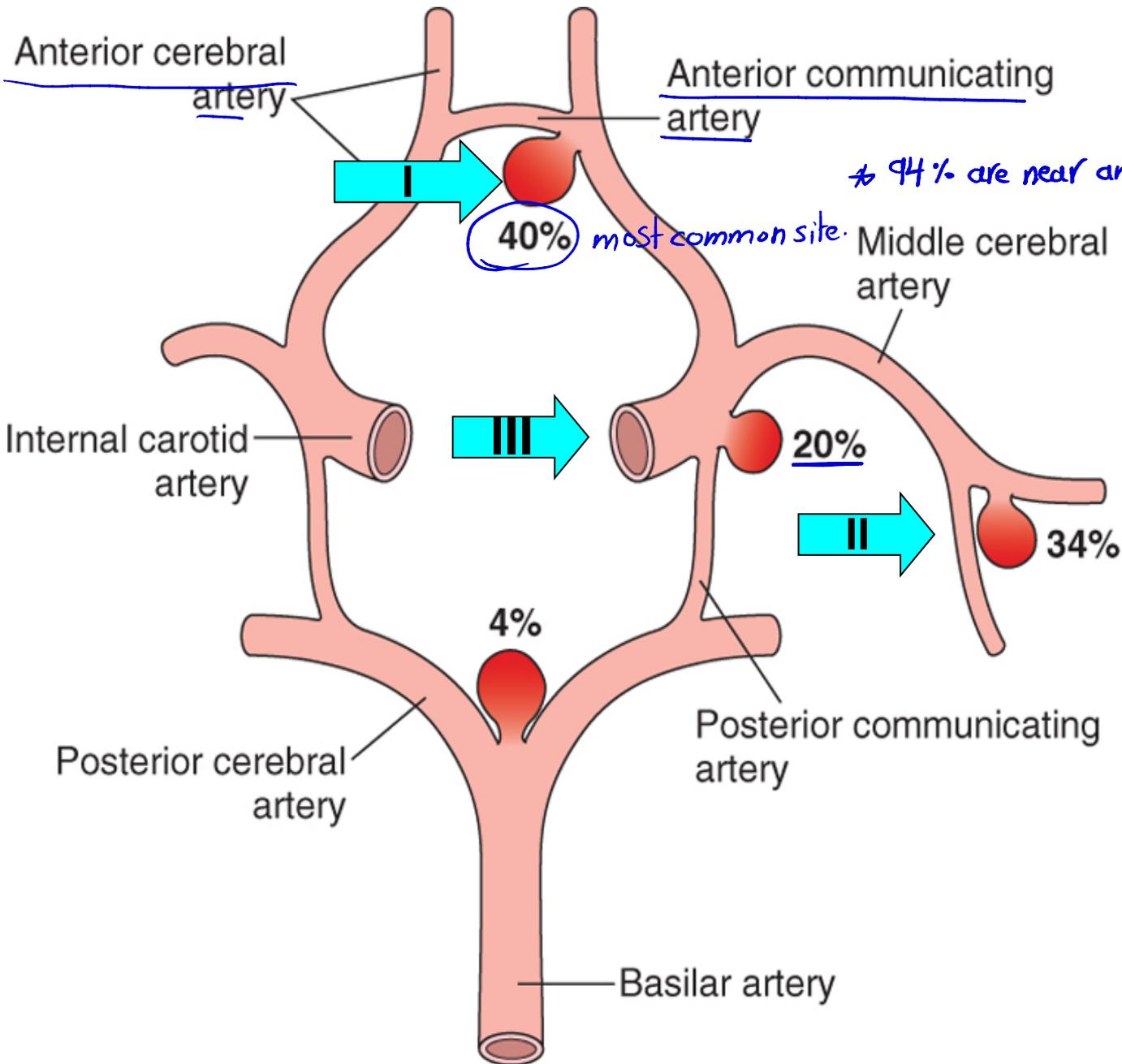
★ Although they are **sometimes referred to as congenital**, they are **not present at birth** but **develop over time** because of **underlying defects in the arterial media.**

★ **There is an ↑ risk of aneurysms** (1) in individuals with **autosomal dominant polycystic kidney disease; & in** (2) in an association with disorders of ECM

كلما زاد حجم ال aneurysm يكون ال wall اخف وبالتالي is more prone to rupture.

★ **The probability of rupture ↑ with the aneurysm size, aneurysms >1cm have a roughly 50% risk of bleeding per year.**

☹ In the **healing phase** of subarachnoid H, **meningeal fibrosis & scarring** occur, sometimes leading to **obstruction of CSF** flow as well as **interruption of the normal pathways of CSF resorption.** → *Leading to Hydrocephalus*



94% are near anterior and middle cerebral arteries.

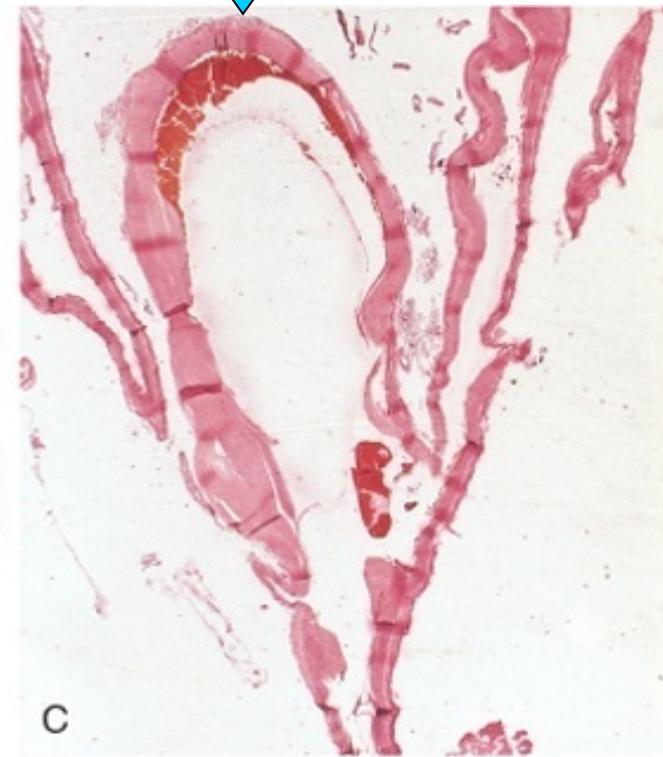
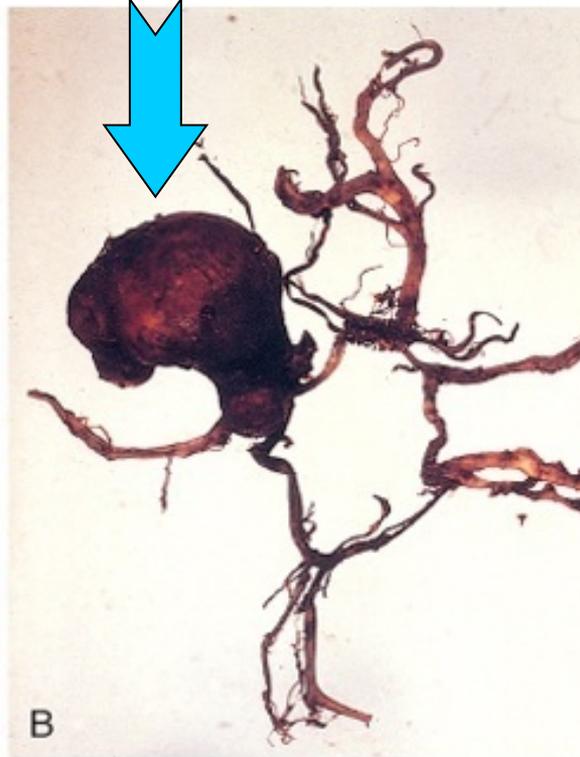
F23-9:
 Relative frequency of common sites of saccular (Berry) aneurysms in the circle of Willis.

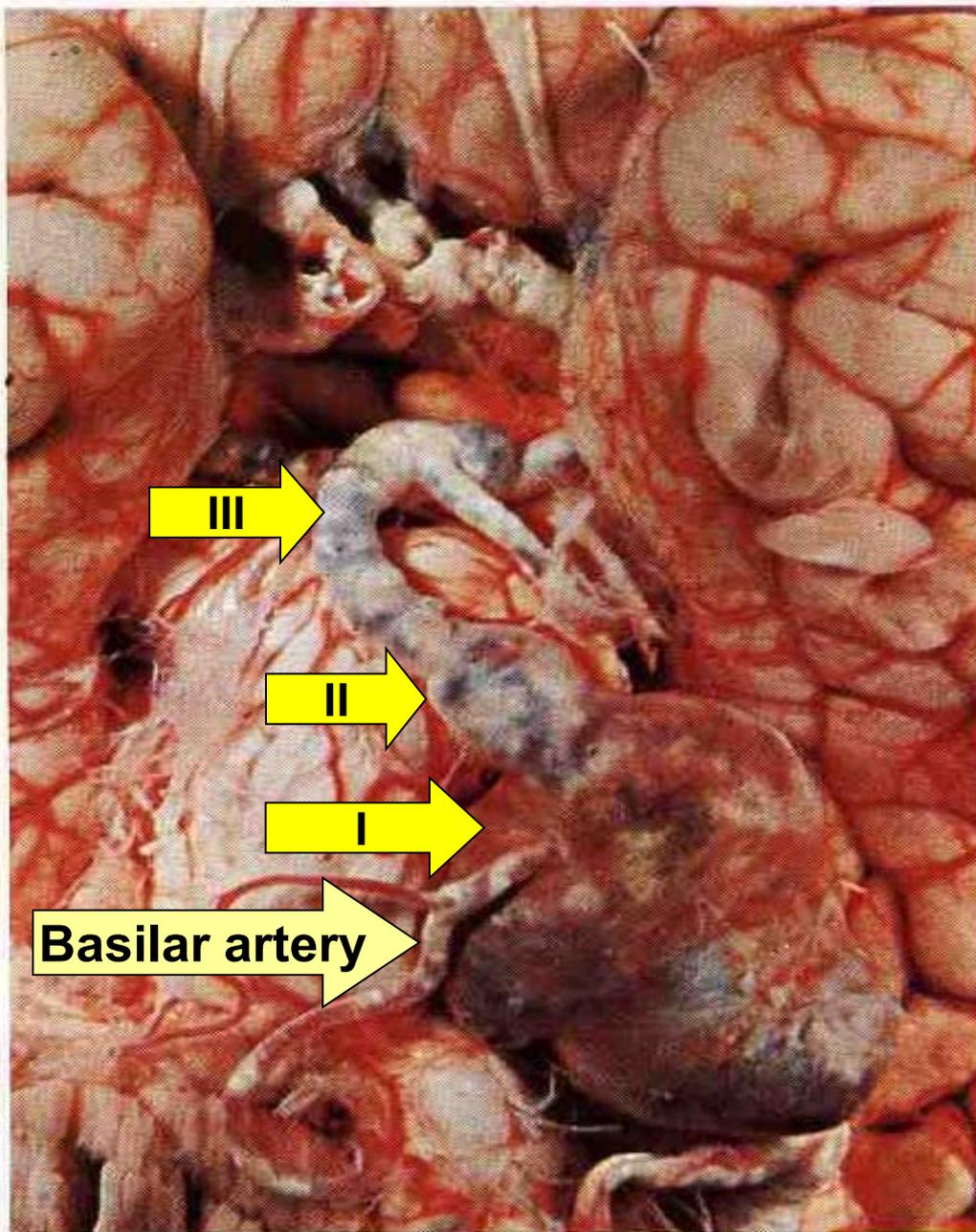
F23-10: **Berry saccular aneurysms.**

A, View of the base of the brain, dissected to show the circle of Willis with an aneurysm of the anterior cerebral artery (arrow).

B, Dissected circle of Willis to show the large aneurysm.

C, Section through a saccular aneurysm showing the hyalinized fibrous vessel wall (H&E).





F 9.39:
Atherosclerotic
aneurysm of
basilar artery.

Large, bluish –black, part- (I) saccular & (II) fusiform part of the 1st part of the artery; (III) Above the site of aneurysm, the basilar artery is dilated with scattered atheromatous plaques seen.

9.39 Aneurysm: basilar artery

Vascular Malformations

Vascular malformations of the brain are classified into 4 main types, based on the nature of the abnormal vessels:

(1) Arteriovenous malformations (AVM), → The most common.

(2) Cavernous angiomas, → tumor. توسع ودية

(3) Capillary telangiectasias, دوالع

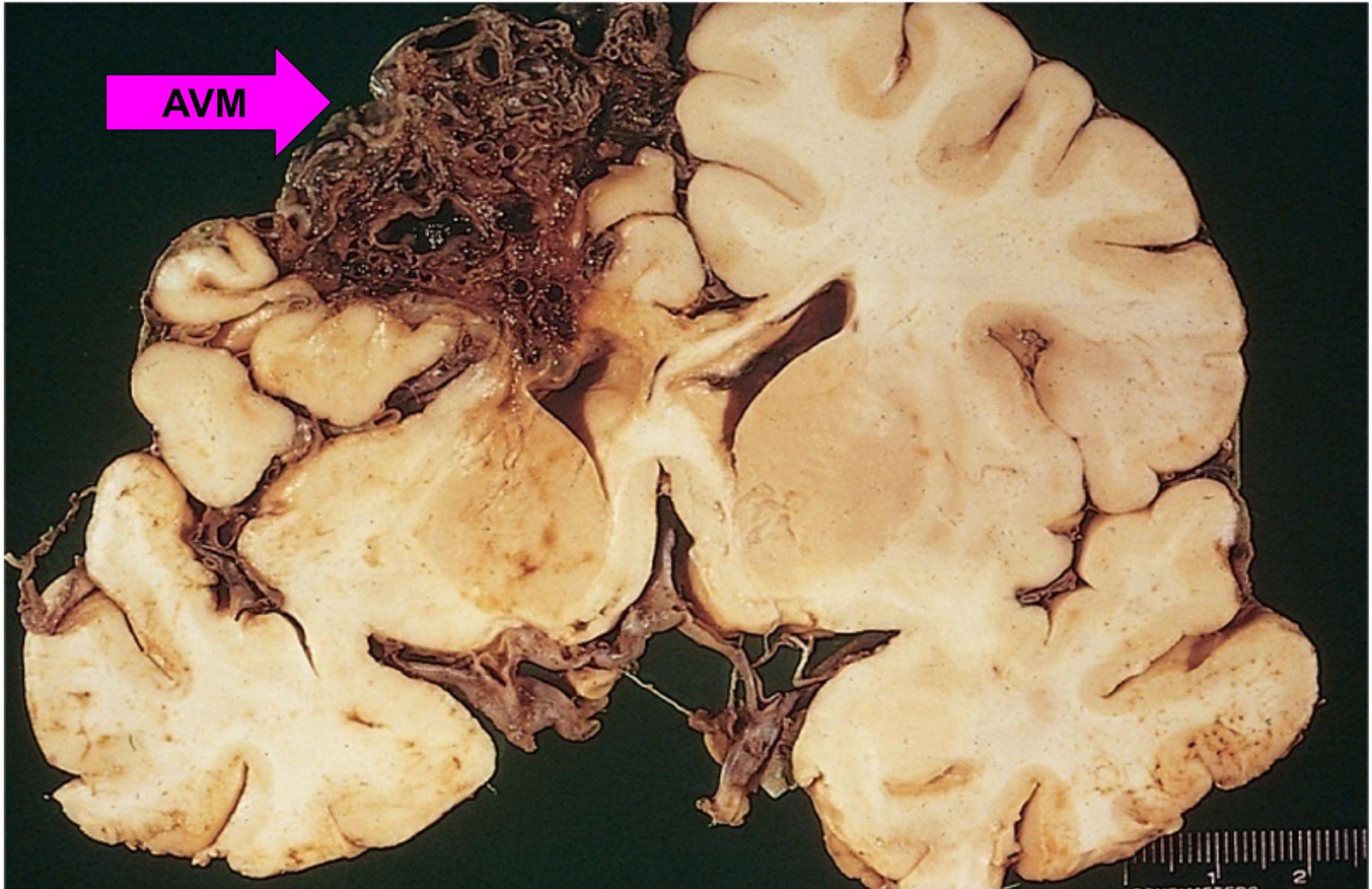
(4) Venous angiomas. مسه مكانها وينه و سيجد Hemorrhage في الامكان نفسه.

(1) **Arteriovenous malformations (AVM)**, the most common, affect males twice as frequently as females; the lesion is most often recognized clinically between the ages of 10 & 30 years, presenting as a (1) **seizure** (epilepsy), Or (2) **H** (intracerebral or subarachnoid, depending on their location).

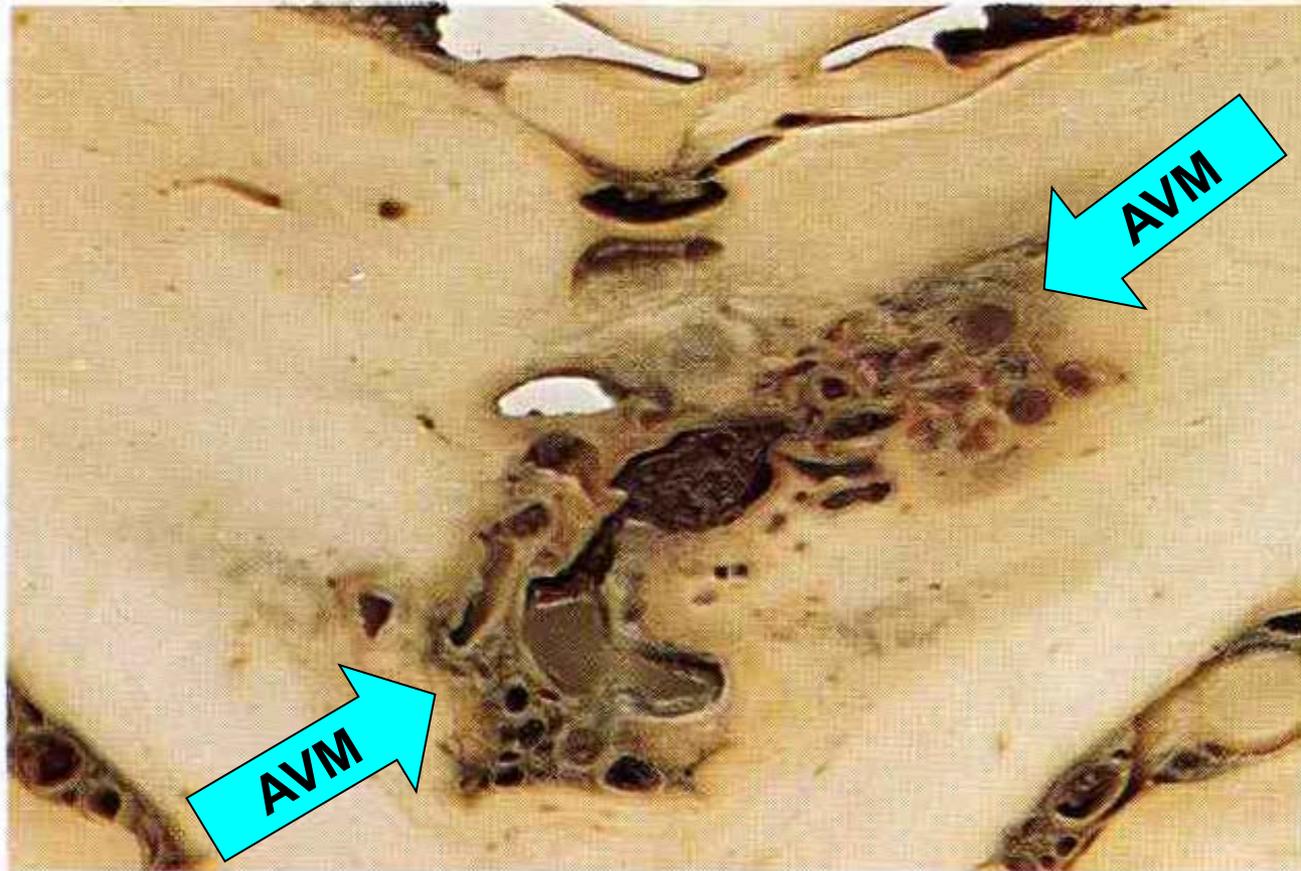
★ Large AVMs occurring in the newborn period can lead to **high-output congestive heart failure** because of blood shunting directly from arteries to veins. ↳ caused by: Anemia, arterial-venous malformation or thyrotoxicosis, or Paget disease

☠ The risk of bleeding makes AVM the **most dangerous** type of vascular malformation (**F23-11 & 9-35**).

F23-11: Arteriovenous malformation in subarachnoid space.



F 9-35: Arteriovenous malformation (hamartoma) : brain. A large complex intracerebral AVM is present within the thalamus & basal ganglia. The greyish-white vessels are thick-walled & many are thrombosed. The adjacent brain contains much brown hemosiderin pigment as a result of previous hemorrhages.



9.35 Arteriovenous hamartoma: brain

تتلف أو توسع. ectasia: * هو توسع في النوعية الدموية.

(3) **Capillary telangiectasias** (■ 4.40) are microscopic foci of dilated, thin-walled vascular channels separated by relatively normal brain parenchyma & occurring mostly in the **pons**.

(4) **Venous angiomas** (varices) consist of aggregates of ectatic (dilated) venous channels (F 9-34).

Lesions 3 & 4 are unlikely to bleed or cause symptoms, & are most commonly discovered incidentally.

normal brain tissue. هاد العيب بعينها عن العيب قبل انه فيها

بسبب عرضين
لانه ما اراها أعراضه.

Hypertensive cerebrovascular disease

Over the past few decades there has been a ↓ threshold for ☺ treatment of hypertension & more extensive screening for early disease, both of which have contributed to an overall ↓ in the incidence of these complications.

Nevertheless, hypertension continues to be important, due to (poor patient compliance) or inadequate access to health care.

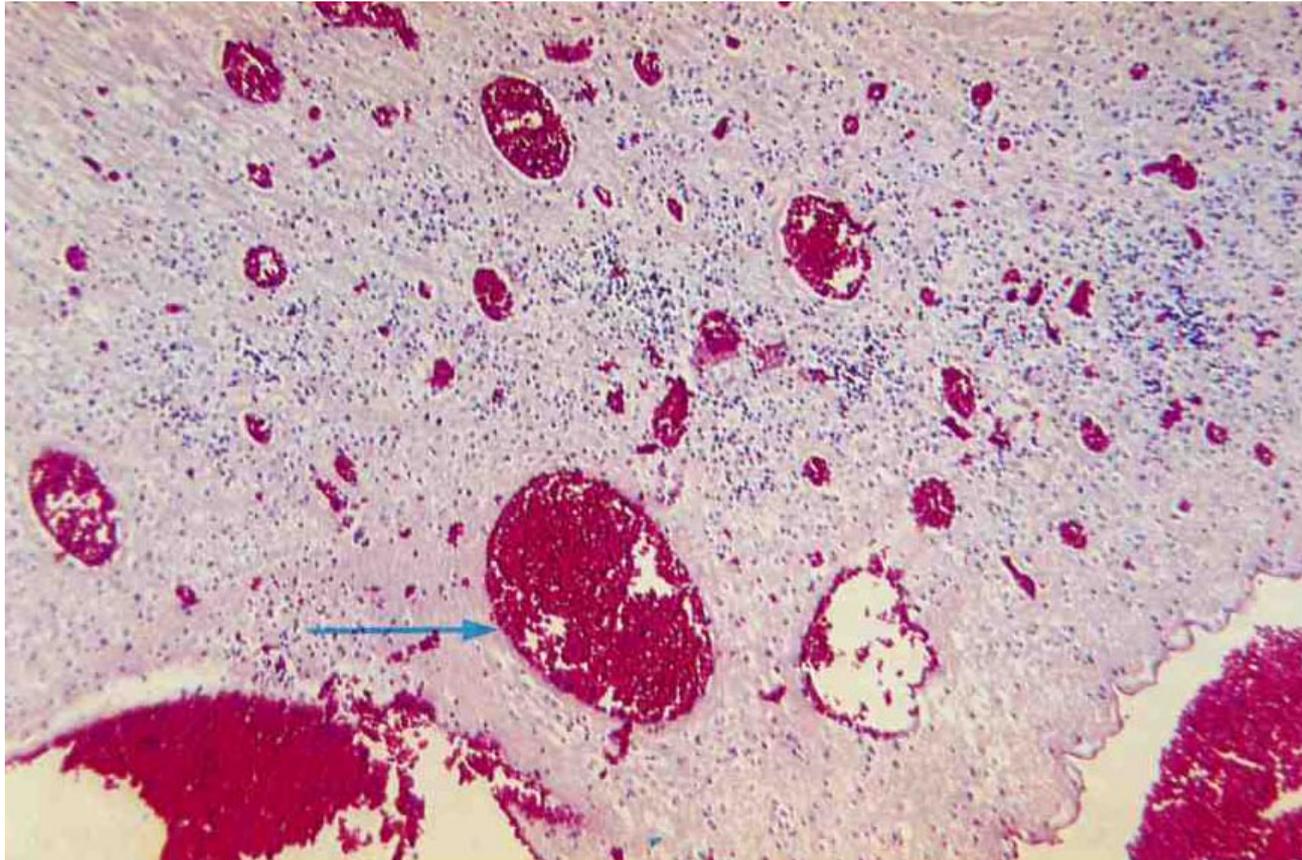
* عدم التزام في العلاج. * تعريف hypertension المفروض يكمل العلاج تقريباً لباقي حياته.

▶ Hypertension affects the deep penetrating arteries & arterioles that supply the basal ganglia & hemispheric white matter & the brain stem.

☹️ 4 Most important **effects of hypertension** on the brain are:

■ 4.40: **Capillary telangiectasia: Brain X 80.** A solitary lesion, consists of abnormally dilated capillaries, each with a very thin wall (arrow), surrounded by thin layer of eosinophilic hyaline amorphous material. The capillaries are **separated by neural tissue & not by fibromuscular tissue** (compare with those seen in an ordinary capillary/ cavernous hemangiomas). Complete resection of this lesion may be difficult or, impossible.

↑ مع
مكتلة قدي



F 9-34: **Venous angioma: brain** forming a complex tangle of dilated & thrombosed veins within the leptomeninges (arachnoid & pia mater) over the left parietal lobe. ☺ **This rare lesion is** unlikely to bleed or cause symptoms & is most commonly discovered incidentally.



9.34 Venous angioma: brain

(1) *Massive hypertensive intracerebral H* (2) Lacunar infarcts
(3) Slit H (4) Hypertensive encephalopathy

(1) Massive hypertensive intracerebral H (see above), in which chronic hypertension is associated with the development of minute Charcot-Bouchard microaneurysms in vessels that are less than 300 μm in \varnothing , these aneurysms can rupture, resulting in Spontaneous intraparenchymal H.

(2) Hyaline arteriolar sclerosis, in which **arterioles** become weaker than normal & are more vulnerable to rupture; the important clinical & pathologic outcome of which is the development of *lacunes* or lacunar infarcts. These small cavitory infarcts are <15 mm, are found most commonly in deep gray matter (basal ganglia & thalamus); internal capsule, deep white matter, & pons, & they consist of tissue loss cavities, with scattered lipid-laden macrophages & surrounding gliosis.

Depending on their location in the CNS, lacunes can either be clinically silent or cause significant neurologic impairment.

(3) Hypertension also gives rise to rupture of the small-caliber penetrating vessels & the development of small H. In time, these H resorb, leaving behind a slitlike cavity (slit → شق *hemorrhage*) surrounded by brownish discoloration.

علة الدماغ بسبب ارتفاع الضغط.
(4) Acute hypertensive encephalopathy is a clinicopathologic syndrome characterized by diffuse cerebral dysfunction, including headaches, confusion, vomiting, & convulsions, sometimes leading to coma ②. أهو شعاعيت بائي فيها المرضية ①

→ Rapid intervention to reduce the accompanying ↑ intracranial pressure is required, since the syndrome does not usually remit spontaneously. تبصير فن اعي مريضه ما يلتزم في علاج hypertension.

☠ **Postmortem examination of fatal cases show an edematous brain, with/or without transtentorial or tonsillar herniation.**

■ H, Fibrinoid necrosis of arterioles & petechiae (of malignant hypertension) may be seen microscopically in the gray & white matter.

Vasculitis

▶ A variety of inflammatory processes that involve BV may lead to luminal narrowing & cerebral infarcts.

Infectious arteritis of small & large BV ^{↳ end-arteritis tubercans.} was **previously** seen in association with **syphilis & tuberculosis**, but now more commonly occurs in the setting of immunosuppression & opportunistic infection (such as toxoplasmosis, aspergillosis, & CMV encephalitis).

★ Some of the systemic forms of vasculitis, such as **polyarteritis nodosa (PAN)**, may involve cerebral BV & cause single or multiple infarcts throughout the brain.

★ ^{منه و هو في السحايا} **Primary angiitis of the CNS** is an inflammatory disorder that involves multiple, small to medium-sized parenchymal & subarachnoid vessels, & is characterized by chronic inflammation, multinucleated giant cells (with or without granuloma formation), & destruction of the BV wall.

Affected individuals manifest a diffuse encephalopathic clinical picture, often with cognitive dysfunction; improvement occurs with steroid & immunosuppressive treatment.