

VWI for Angiogram-Neg/Indeterminant SAH

Imaging	Penn Approach
	<p>Ddx pathologies: Blister/perforator/dissecting/bifurcation/multiple aneurysms, intracranial dissection/pseudoaneurysm, occult AVM/AVF</p> <p>Interpretation Pearls: Suggest remaining descriptive; if 2nd DSA planned, can suggest attention to a questioned vessel segment.</p>
NCHCT	Assess SAH pattern. Laterality? Anterior/Posterior circulation?
CTA head & DSA	Review images & report. If performed during DSA, review cone-beam CTA & surface renderings
VWI Brain	<p>Pre-VWI: evaluate COW vessel walls, 3-planes</p> <p>Post-VWI: evaluate COW vessel walls, 3-planes (eg vessel wall/thrombus enhancement, enhancing dot, intimal flap?)</p> <p>SWI/3DT2STAR: evaluate COW, epicenter of hemorrhage (eg if multiple aneurysms), SWI-capping, cavernous malformation...etc</p> <p>Post-VWI: leptomeningeal/parenchymal enhancement</p> <p>TOF MRA: occult vascular malformation, luminal irregularity</p>
C-spine (limited)	If posterior fossa SAH & limited C-spine requested: serpiginous flow voids, cord edema, cord enhancement (Note: DSA is gold standard)

References with links

Utility of VWI in Angio-Neg SAH

[*Yoon et al. JKNSurg. 2022.](#)

[*Jung et al Clin Neurorad. 2021.](#)

Utility of SWI in BAPAs (SWI Capping)

[*Zhu et al. JNIS. 2022.](#)

CTA-neg SAH Patterns

[*Heit et al. AJNR. 2016.](#)

Penn's VWI pulse sequence is not optimized to assess saccular aneurysms & rupture risk.

SAH Patterns

(A) Perimesencephalic SAH: interpeduncular, prepontine, ambient, quadrigeminal plate, or premdullary cistern with minimal extension into medial Sylvian fissures

(B) Sulcal/Convexity SAH

(C) Diffuse SAH: Perimesencephalic pattern + Sylvian fissures

(D) Isolated IVH

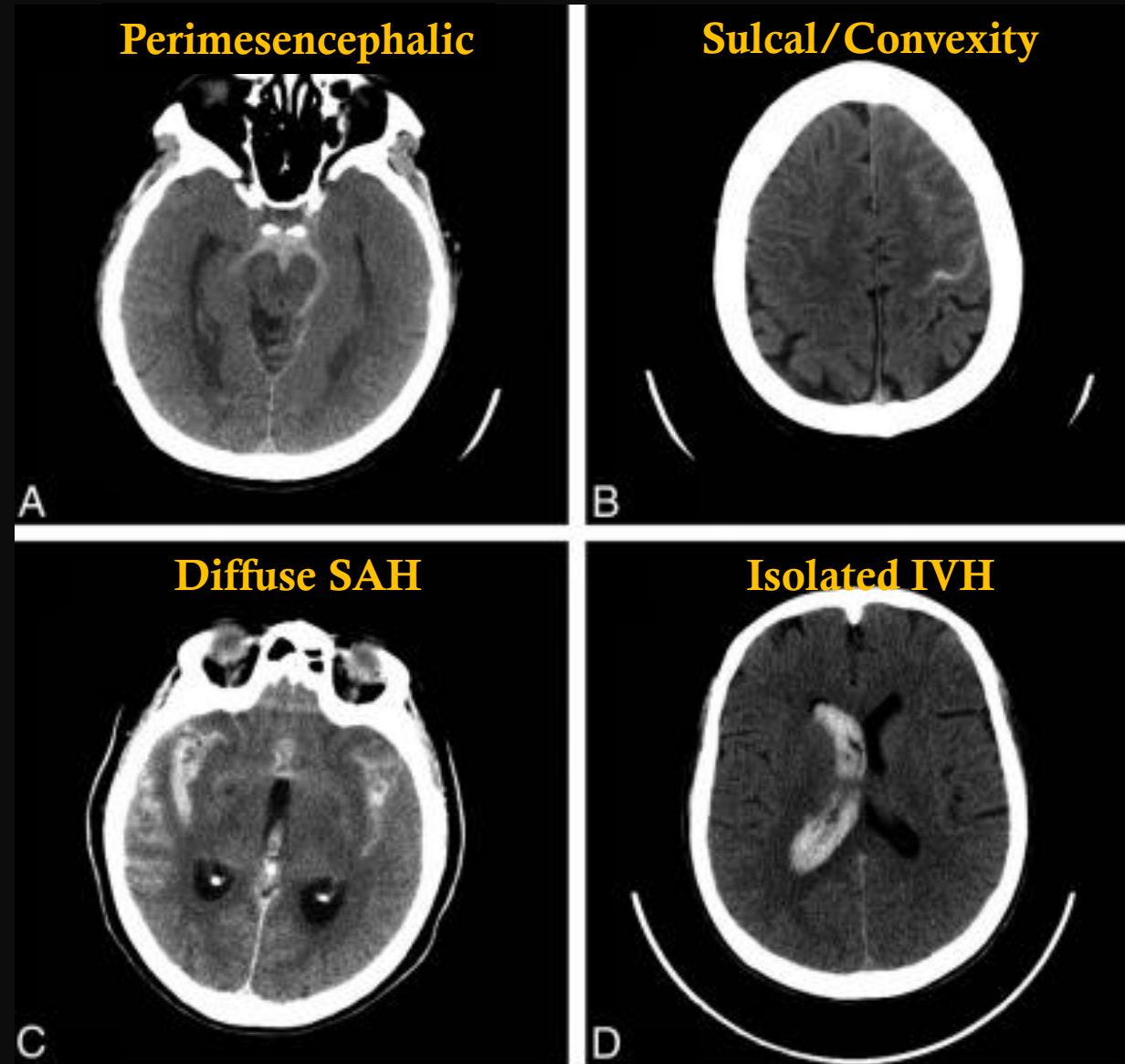


Table 4: Subarachnoid hemorrhage pattern and final diagnosis^a

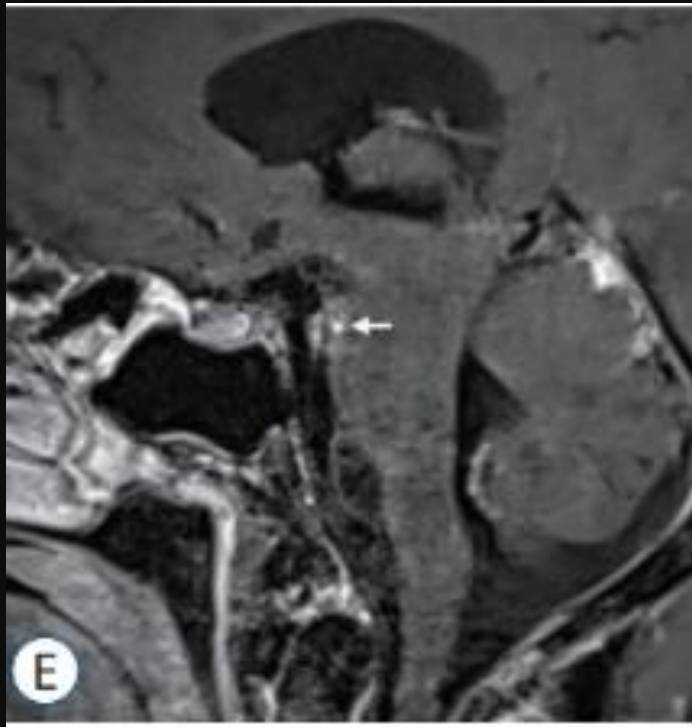
	Pattern of SAH				
	No SAH ^b	Perimesencephalic	Sulcal	Diffuse	IVH
No source identified	0	68 (96%)	24 (65%)	79 (85%)	13 (100%)
Aneurysm/pseudoaneurysm	0	2 (3%)	0	16 (17%)	0
AVF	0	0	1 (3%)	0	0
AVM	0	0	1 (3%)	0	0
Vasculitis	0	1 (1.5%)	12 (32%)	0	0
Cavernous malformation	1 (3%)	0	0	0	0

^a Percentages reflect patient percentage with a vascular pathology within each SAH pattern.

^b "No SAH" refers to patients with xanthochromia or isolated IVH.

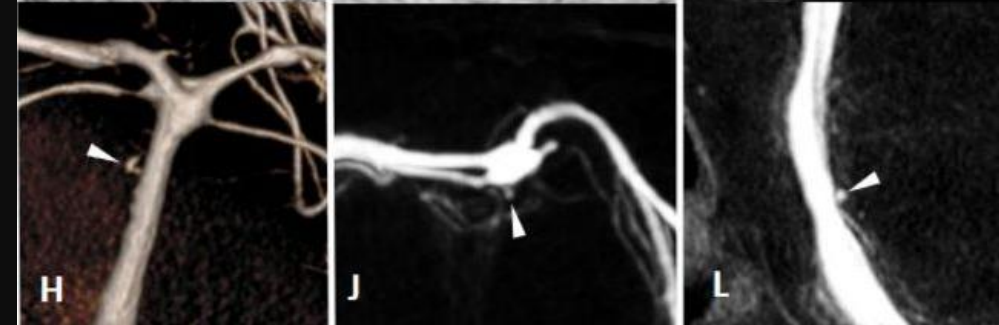
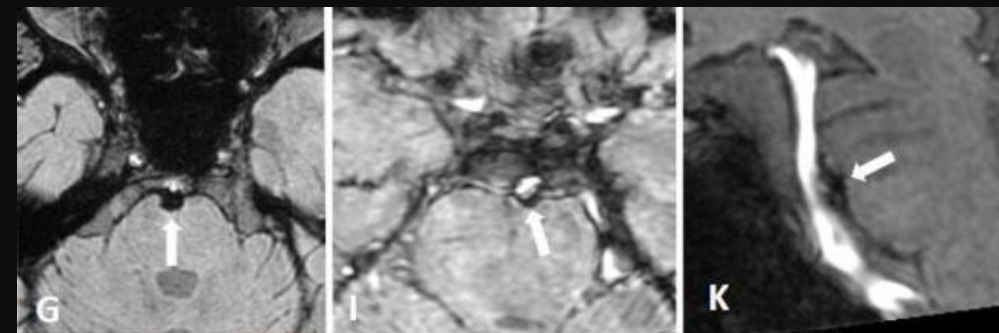
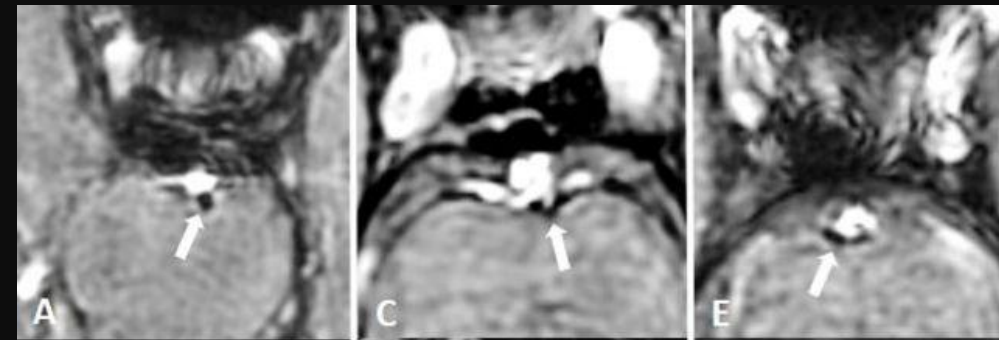
Example VWI Findings to Look For

Ruptured **perforator aneurysm** on basilar artery
(**enhancing dot**).



Yoon et al. JKNSurg. 2022.

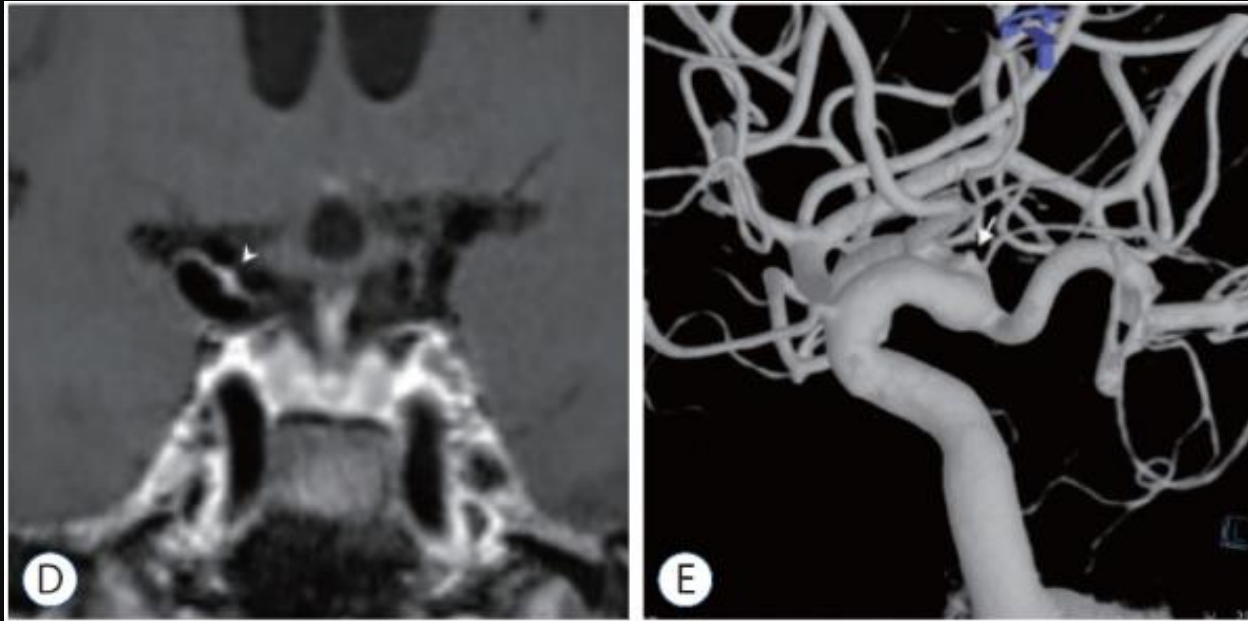
Ruptured **SWI-capping** of ruptured
basilar artery **perforator aneurysm**.



Zhu et al. JNIS. 2022.

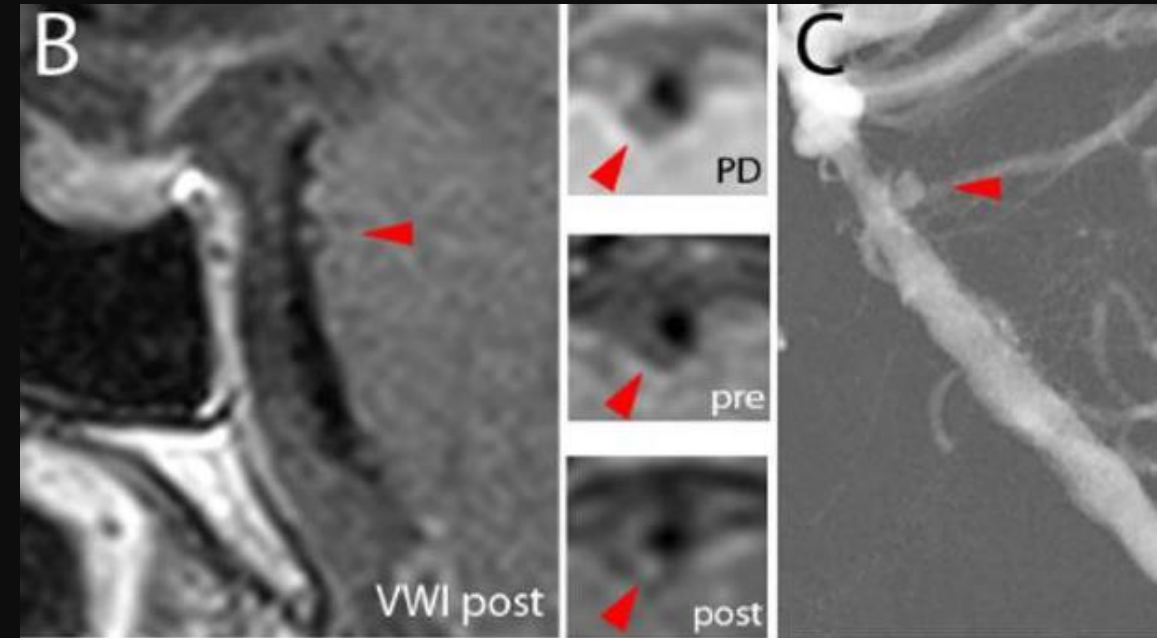
Example VWI Findings to Look For

Blister aneurysm on right internal carotid artery.



Yoon et al. JKNSurg. 2022.

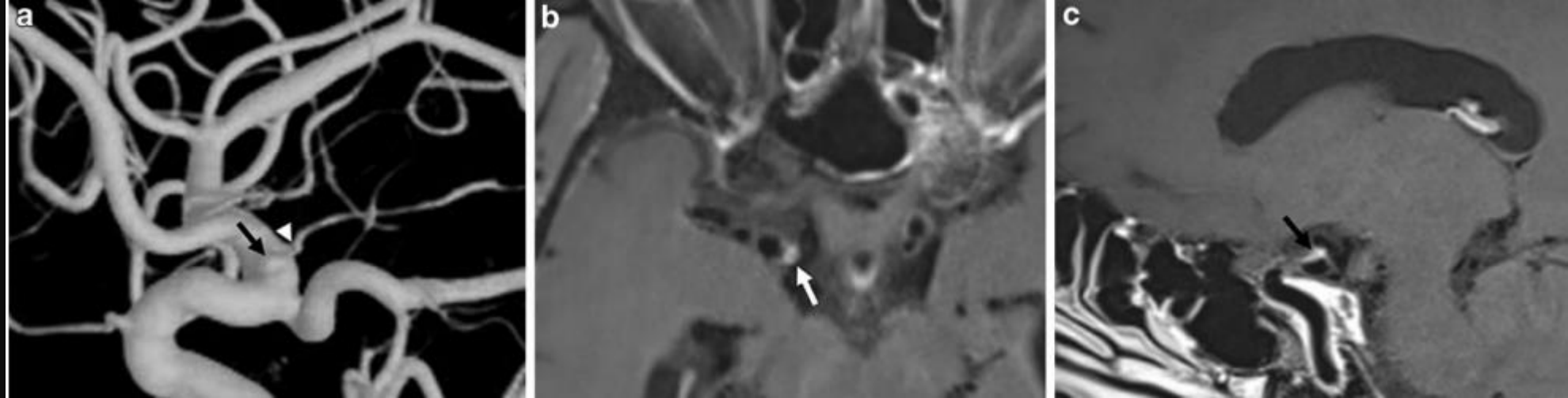
Basilar artery **perforator aneurysm**.
(enhancing dot).



Cox et al Neurohospitalist. 2021.

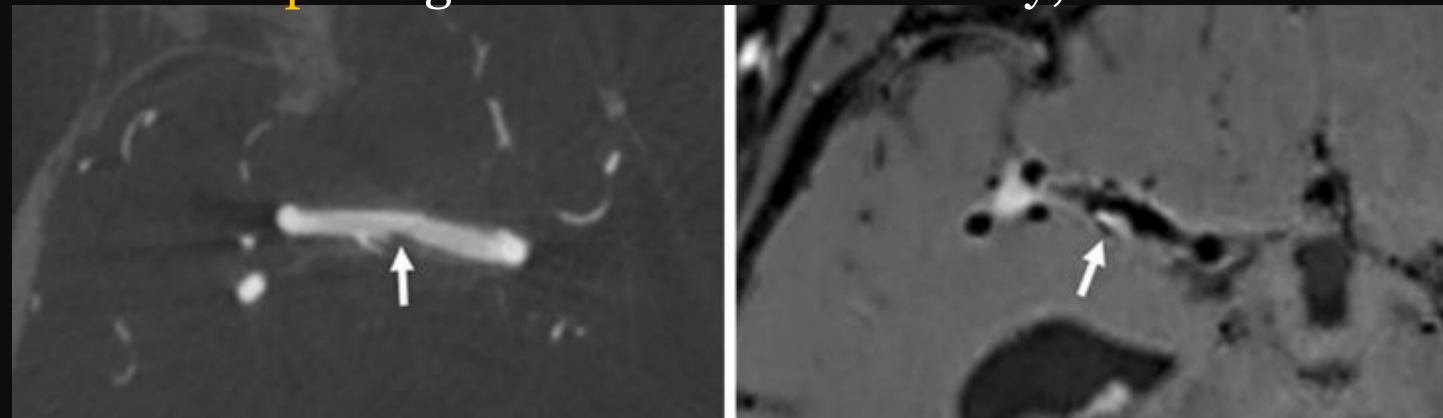
Example VWI Findings to Look For

Blister aneurysm on right internal carotid artery.



Jung et al Clin Neurorad. 2021.

Intimal flap of right middle cerebral artery, **dissection**.



Jung et al Clin Neurorad. 2021.