KANSAS INITIATIVE FOR STROKE SURVIVAL

A PROJECT BY AND FOR KANSANS

Phone (913) 588-1554 • Fax (913) 945-8892

Subarachnoid Hemorrhage

"First Tuesdays" Lecture Series

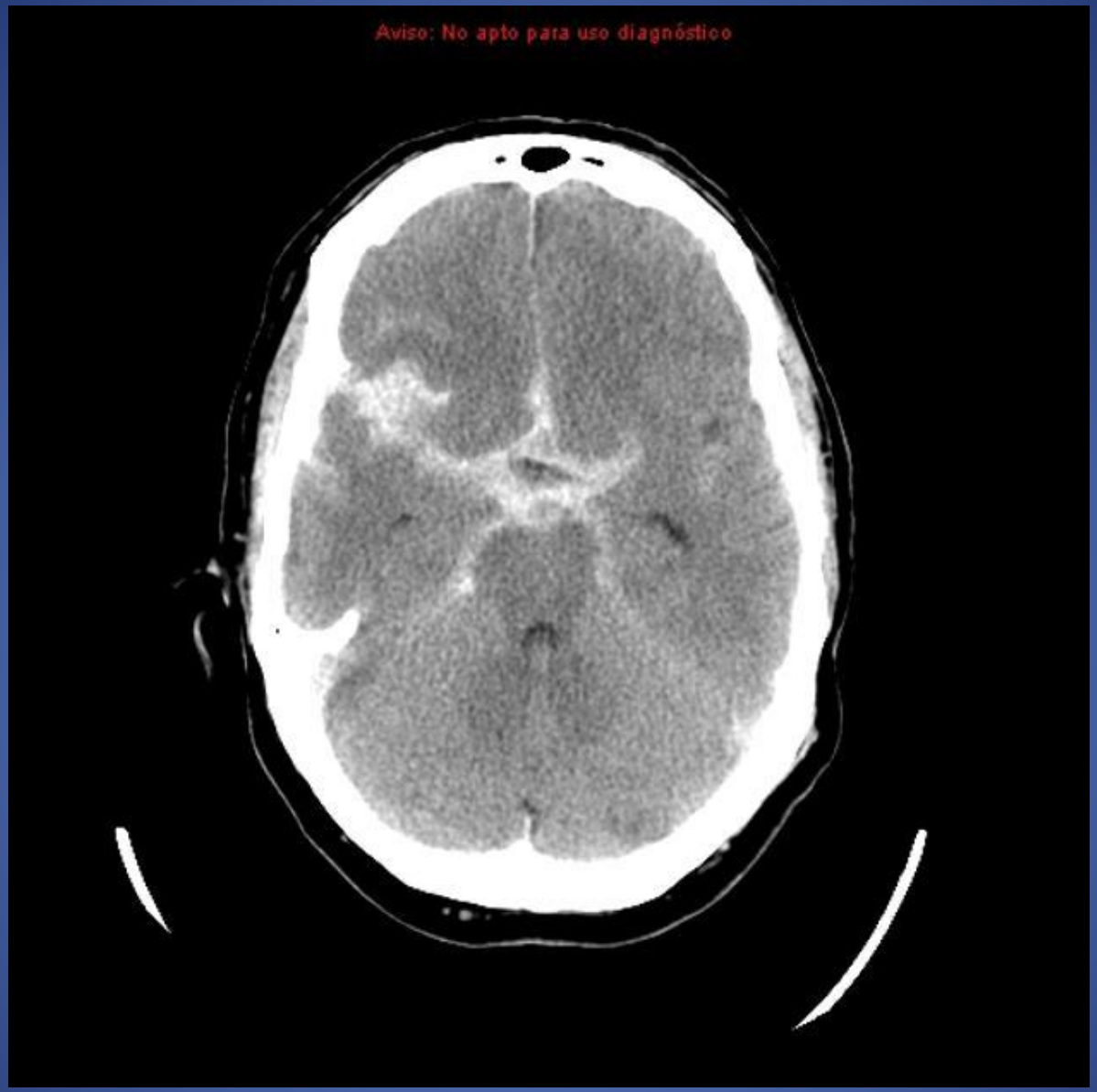
Introduction and Goal of “First Tuesdays”

- Sabreena Slavin MD – Vascular Neurologist and Neurohospitalist at KU School of Medicine
- Didactic lecture series as part of the Kansas Initiative for Stroke Survival
- Updates in Practice and FAQ’s on Acute Stroke Care
- 30 minutes for didactics and questions/discussion.

Nontraumautic subarachnoid hemorrhage

- 5% of all strokes, younger age group
- Most common causes
  - Ruptured aneurysms: 85%
  - Perimesencephalic hemorrhage: 10%
  - Rare causes: 5%
    - Inflammation of arteries including mycotic aneurysms, CNS vasculitis (parenchymal component)
    - Cerebral AVM's, dural AVF's, cavernomas (parenchymal component)
    - Arterial dissection (parenchymal component)
    - Moyamoya disease (ventricular component)
    - Tumors (parenchymal component)
    - Drugs: cocaine

van Gijn et al, *Lancet* 2007

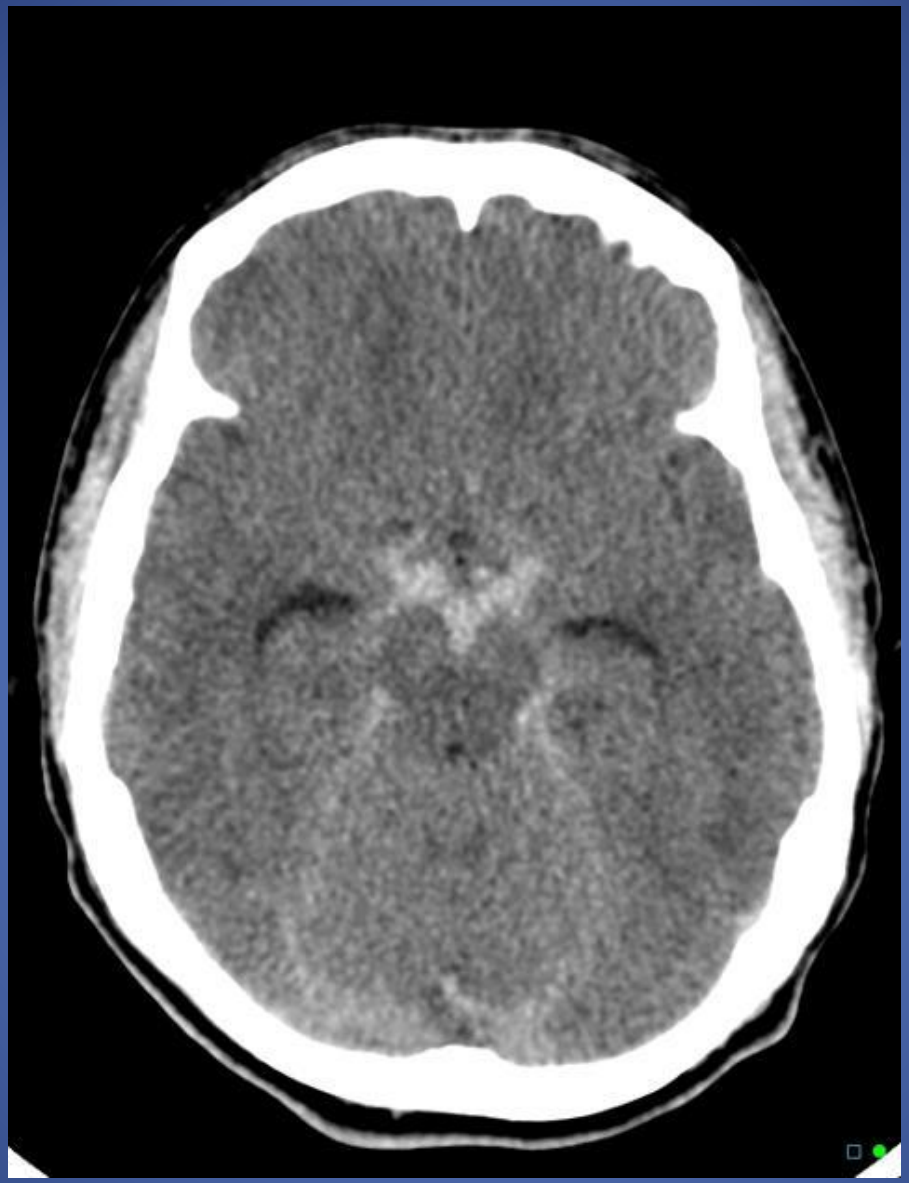


Zamora Verduga TP. Aneurysmal Subarachnoid Hemorrhage. Reference article, Radiopaedia.org. (accessed on 14 Apr 2022) https://radiopaedia.org/cases/aneurysmal-subarachnoid-haemorrhage-2?lang=us

Aneurysmal SAH

- Rupture risk increases with aneurysm size (>7 mm higher risk)
- Rupture can be precipitated by exercise, sexual intercourse, straining
- Modifiable risk factors: HTN, smoking, excessive ETOH
- Genetic risk factors:
  - Screening should be done in patients with two or more first-degree relatives with aneurysmal SAH (exceptions can be made for younger cases)
  - In autosomal dominant polycystic kidney disease, 10% will have aneurysms

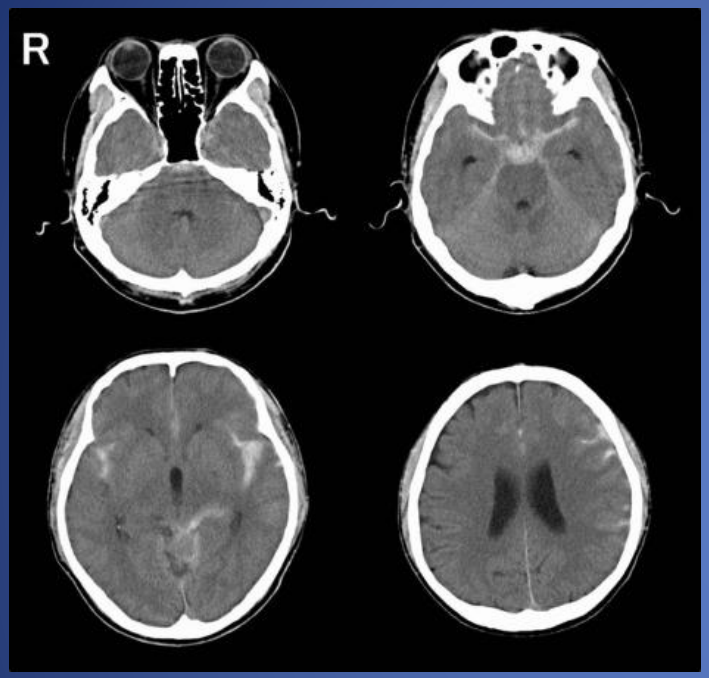
van Gijn et al, *Lancet* 2007

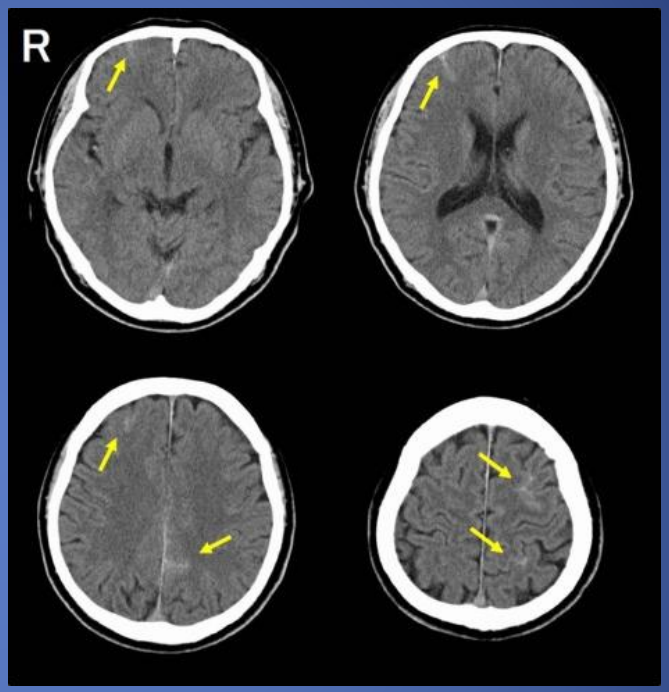


Dawes, L., Curry, B. Perimesencephalic subarachnoid hemorrhage. Reference article, Radiopaedia.org. (accessed on 14 Apr 2022) https://doi.org/10.53347/rID-3788

Perimesencephalic subarachnoid hemorrhage

- Etiology is mostly venous bleed, but 5% can be due to vertebrobasilar aneurysm with worse prognosis
- Onset more gradual
- Centered around brainstem and basal cisterns
- CTA can usually exclude a vertebrobasilar aneurysm





Left transverse-sigmoid sinus dural AVF

Right transverse-sigmoid sinus dural AVF

Ohshima et al, *J Stroke and Cerebrovasc Dis* 2017

Diagnosis of SAH

In study with 2000 patients with severe headache rapidly peaking:

Table 1:

Clinical features to help determine the likelihood of subarachnoid hemorrhage in neurologically intact patients who present with a severe acute headache that is rapidly peaking or accompanied by syncope*

Presence of variable increases likelihood of subarachnoid hemorrhage	Positive likelihood ratio
Neck stiffness (flexion/extension) on examination	5.94
Loss of consciousness, witnessed	4.59
Loss of consciousness, not witnessed	3.77
Absence of variable decreases likelihood of subarachnoid hemorrhage	Negative likelihood ratio
Worst headache of life	0.31
Complaint of neck stiffness or pain	0.42
Arrival by ambulance	0.52

Fine et al, *CMAJ* 2012

Other history features

- 2/3 have depressed consciousness
- 1 in 7 with ruptured aneurysm have intraocular hemorrhage seen on fundoscopy
- 1 in 14 can have seizures
- Can have cranial nerve deficits, including 3rd nerve palsy if ICA/Pcomm location
- ECG changes common, 3% have cardiac arrest
- Vomiting not sensitive or specific

van Gijn et al, *Lancet* 2007

Emergency workup

- CT brain w/o contrast
- CTA head/neck: sensitivity on detecting aneurysms is 95%
- Cerebral angiogram: gold standard for aneurysms, but can cause risks of ischemia or rupture of aneurysm (less than 2%)
- Lumbar puncture??

van Gijn et al, *Lancet* 2007

Do you need LP?

- Study investigating 2123 adults with acute thunderclap headache and no neurological involvement, **within first 6 hours of onset,** CT brain detected all 121 patients with SAH (sensitivity 100%, 95% CI 97-100%) [1]
- Later on worse → another study found that with a significant pretest probability of SAH, CT brain would miss 1 in 700 cases if done 12 hours post headache onset and 1 in 80 cases if done 24 hours post headache onset[2]
- If LP is needed, need to wait at least **6 hours post headache onset** and ideally 12 hours post onset to differentiate between traumatic tap (SAH will have bilirubin in CSF)[3]

1. Perry et al, *BMJ* 2011; 2. Coats et al, *Eur J Emerg Med 2006;*
3. Vermeulen et al *J Neurol Neurosurg Psychiatry* 1990

CSF analysis

- If CSF looks bloody, need to spin immediately (not later) for xanthochromia

van Gijn et al, *Lancet* 2007

SAH management

- Case fatality rate about 50%
- After first few hours, need to monitor for rebleeding, vasospasm causing ischemia, and hydrocephalus
- Treat SBP greater than 140

SAH grading scales

SAH Clinical Grading Scales

Grade	Hunt and Hess	WFNS
0		Intact aneurysm
1	Asxic / mild HA	GCS 15
1a	Fixed neuro deficit s men. or brain rxn	
2	Mod to sev HA, CN palsy, nuchal rigidity	GCS 13–14 no motor deficit
3	Lethargy, confusion, mild focal deficit	GCS 13–14 motor deficit
4	Stupor, hemiparesis, early decerebrate	GCS 7–12 +/- motor deficit
5	Coma, decerebrate, moribund	GCS 3–6 +/- motor deficit

Table 1. Modified Fisher Scale (Table view)

Grade	Focal or Diffuse Thin SAH	Focal or Diffuse Thick SAH	IVH	
0	–	–	–	No SAH; no intraventricular blood
1	+	–	–	Thin diffuse or focal subarachnoid blood; no intraventricular blood
2	+	–	+	Thin diffuse or local subarachnoid blood; with intraventricular blood
3	–	+	–	Thick focal or diffuse subarachnoid blood; no intraventricular blood
4	–	+	+	Thick local or diffuse subarachnoid blood; intraventricular blood

Rebleeding

- Occurs most often in the first 24 hours
- High mortality and disability if occurs
- Coiling vs clipping is needed asap
- Factors associated with rebleeding: Higher WFNS grade, modified Fisher scale, presence of intracerebral hemorrhage, posterior circulation aneurysms, > 10 mm sized aneurysms

Donkelaar et al, *Stroke* 2015; Tang et al, *PLoS One* 2014

Vasospasm

- Patients require up to 3 weeks of monitoring for arterial narrowing that can cause ischemia after aneurysmal SAH
- Peak time: 4-14 days
- Monitoring: transcranial dopplers
- Treatment: oral Nimodipine for prevention, IA calcium channel blockers using Nicardipine and Verapamil, balloon angioplasty

Pluta et al, *Neurol Res* 2009

Hydrocephalus

- More common in patients with IVH or hemorrhage in perimesencephalic cisterns
- Need sequential CT scans for developing hydrocephalus
- Mostly treated by external ventricular drain

Conclusions

- Suspect SAH in patients with worst headache of life, acute onset of headache, and especially with meningeal signs, alteration of consciousness/syncope, or neurological deficits
- CT brain and CTA is sufficient in most cases if patient prevents acutely
- If suspicion remains for aneurysmal bleed, needs formal cerebral angiogram
- Needs transfer to neurological ICU with neurosurgical services to treat and prevent rebleeding and vasospasm

Questions?

- Call for help anytime!
- KU BAT phone: 913-588-3727
- http://www.kissnetwork.us/
- sslavin2@kumc.edu