



KANSAS INITIATIVE FOR  
STROKE SURVIVAL  
A PROJECT BY AND FOR KANSANS

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

# Blood Pressure Management in Ischemic Stroke

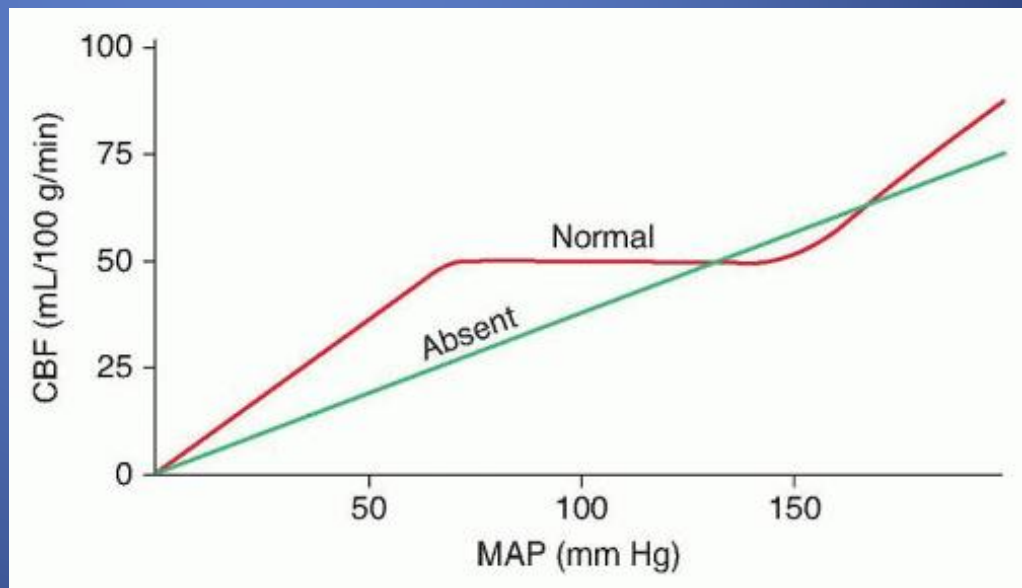
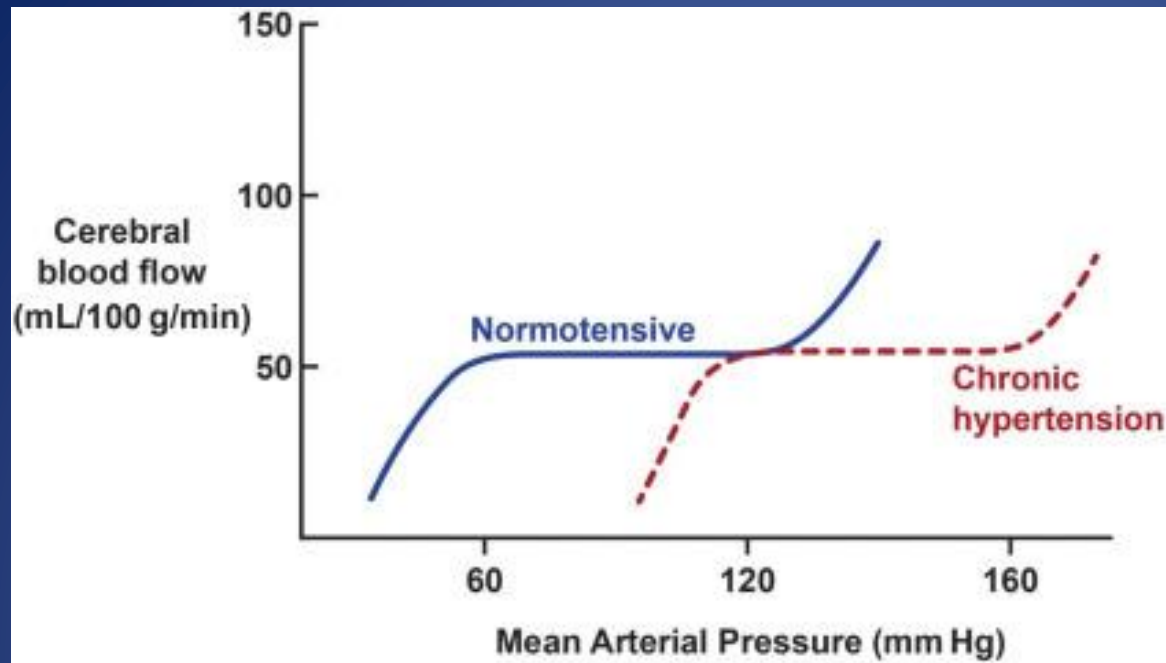
“First Tuesdays” Lecture Series  
Sabreena Slavin, MD

# Introduction and Goal of “First Tuesdays”

- Didactic lecture series as part of the Kansas Initiative for Stroke Survival (KISS)
- Updates in Practice and FAQ's on Acute Stroke Care
- 30 minutes for questions/discussion

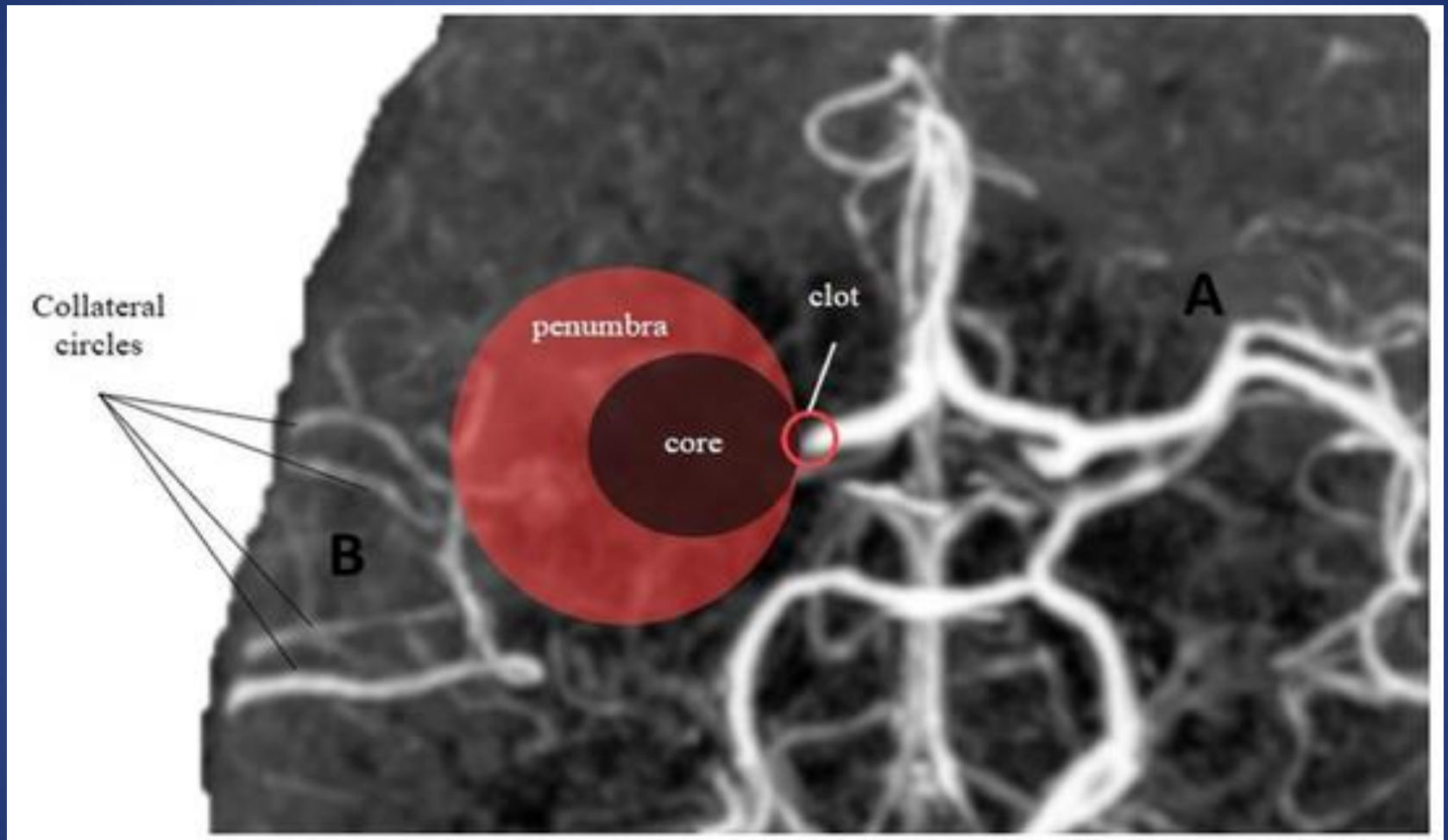
# BP management cases

- No acute intervention
- IV Thrombolytics
- Endovascular intervention (mechanical thrombectomy)
- Long term management
- Special circumstances



# Permissive hypertension

- Cerebral autoregulation is disrupted in the ischemic region, making cerebral blood flow dependent on systemic BP
- Especially in those with chronic hypertension, there may be a shifted autoregulatory curve where they are even more susceptible to low BP
- Admission SBP < 120 or SBP > 220 have both been associated to higher mortality.
- Too low BP: hypoperfusion and more ischemia/infarct
- Too high BP: edema or hemorrhage
- In patients not receiving thrombolytic therapy, AHA/ASA guidelines are to not treat BP acutely unless BP > 220/120



# Evidence for permissive HTN

- One review analyzed 18 articles from 1987-2014 comparing post stroke patients without treatment assigned to antihypertensive treatment group vs placebo group.
- Out of a total of 10,132 patients, there was a 13% relative risk in all-cause mortality in placebo compared with antihypertensive treatment group.

# Pre and post thrombolytic

- NINDS rt-PA Stroke Trial which provided a benefit for IV tPA over placebo had a lower rate of intracerebral hemorrhage than previous thrombolytic trials due to careful treatment of hypertension
- AHA/ASA guidelines recommend that BP needs to be controlled:
  - Less than 185/110 prior to receiving IV thrombolytic
  - Less than 180/105 in the first 24 hours after receiving IV thrombolytic

# Evidence for BP control surrounding thrombolytics

- One review analyzed the association between BP levels before and after IV thrombolytic with outcome measures and found 26 studies including 56,513 patients.
- Higher SBP levels correlated with increased likelihood of symptomatic ICH and worse 3-month functional independence.

# Choice of antihypertensive agent

- AHA/ASA guidelines recommend IV Labetalol and Nicardipine infusion. Also Nitroprusside can be used if BP remains elevated. However, the evidence behind choice of agent is controversial. There is some data that beta blockers may be associated with worse outcome.
- Other agents with evidence include Hydralazine, Enalapril, and Clevidipine due to their rapid effect.
- Typical dosing:
  - Labetalol 10-20 mg over 1-2 minutes. Can repeat once in 15 minutes
  - Nicardipine infusion 5-15 mg per hour. Titrate every 5-15 minutes at 2.5 mg increments

# How low is too low?

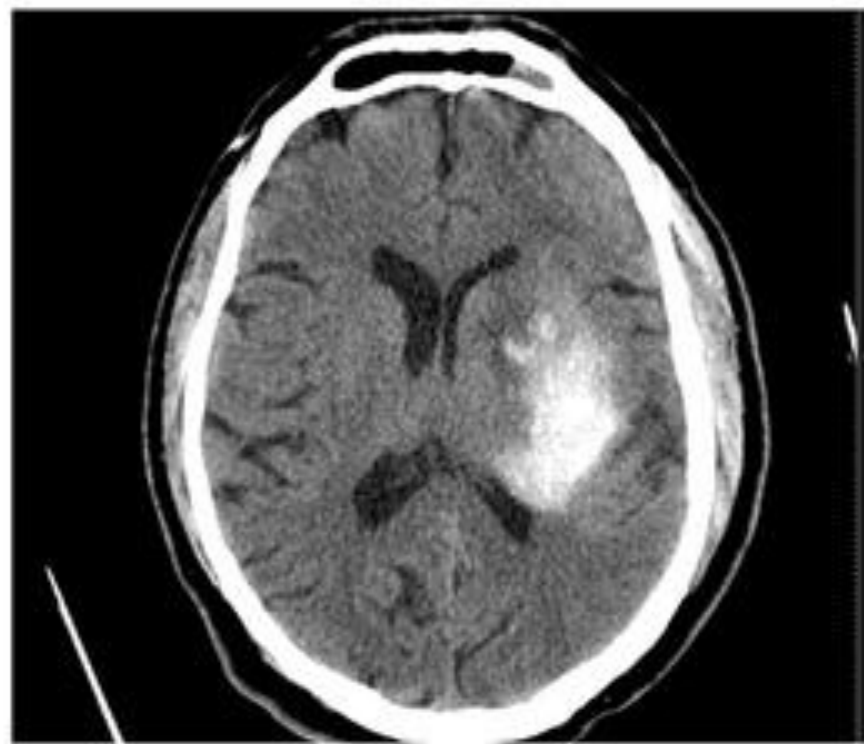
- Generally, controlling SBP less than 140 is not recommended even in setting of receiving IV thrombolytics.
- ENCHANTED trial included >2000 subjects post IV thrombolytic randomized to standard guidelines of SBP less than 180 vs more intensive SBP goal of 130-140: found that there was no significant difference in 90-day functional outcome.

# Pre and post endovascular intervention

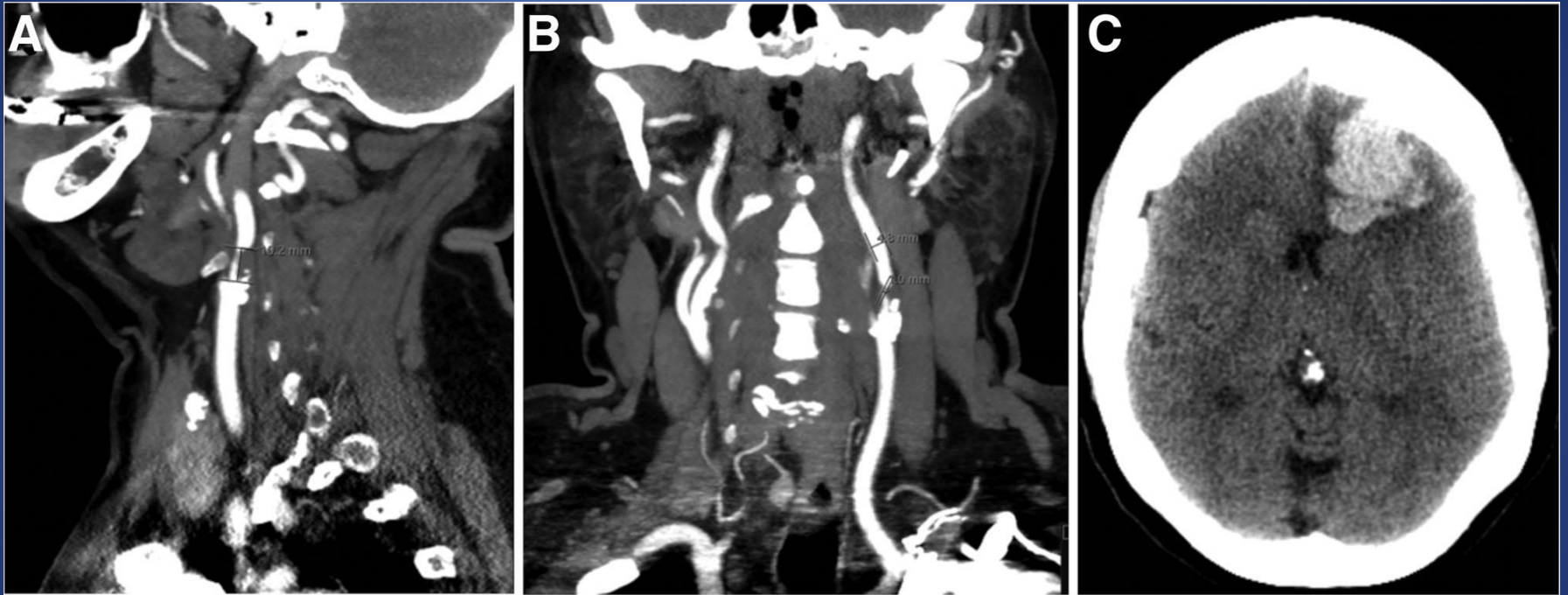
- AHA/ASA guidelines state that it is reasonable to keep SBP less than 180/110 prior to procedure.
- Pre EVT, need to keep cerebral blood flow up so that ischemic penumbra can maintain good perfusion through collaterals.
- Post EVT, there is risk of ischemic-reperfusion injury. Higher BP increases capillary hydrostatic pressure and disrupts blood-brain barrier, which can lead to bleed.



(A)



(B)



# Post EVT BP goals

- SBP less than 160/90 during first 24 hours had lower mortality in one observational study. In another study, SBP less than 120 during first 24 hours had lower mortality and better functional outcome.
- **Previous method** of basing SBP goal based on degree of reperfusion:
  - TICI 2c-3: SBP less than 150
  - TICI 2b: SBP less than 160
  - TICI 2a or worse: similar to no treatment goals; may also consider augmentation

# Post EVT BP goals: RCT's

- ENCHANTED2/MT trial randomized to SBP less than 120 vs SBP 140-180: patients in the intensive group had worse outcomes, including a worse 90-day mRS.
- OPTIMAL-BP trial randomized to SBP less than 140 vs 140-180: patients in intensive group had worse cerebral edema and lower functional independence.
- BEST-II trial randomized to SBP < 140 vs SBP < 160 vs SBP < 180: no significant difference but trends favored the <180 group.
- **AHA/ASA guidelines that BP be maintained less than 180/105 for 24 hours post EVT.** They caution against keeping SBP below 140 as it can cause harm.
- Patients with incomplete recanalization may still require higher BP goals.

# Long term BP management

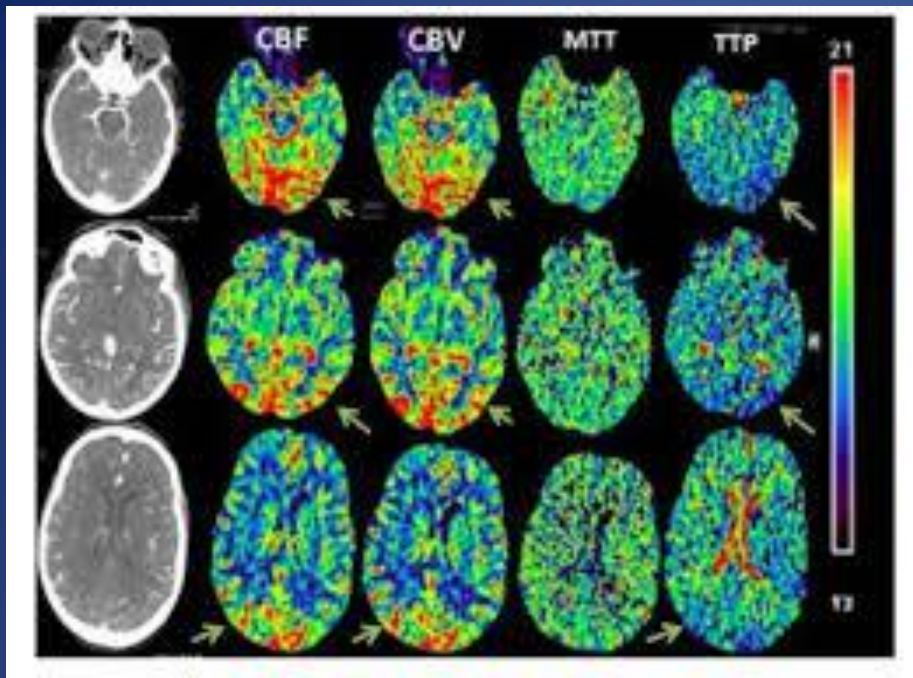
- Hypertension is most significant risk factor of stroke worldwide.
- Relationship between BP and risk of stroke is linear.
- AHA/ACC guidelines recommend treating BP less than 130/80.
- Timing: Canadian Stroke Guidelines 2018 state reducing BP by 15% over the first 24 hours and not greater than 25%, with further gradual reduction to target after 24 hours is reasonable.
- Timing: ESO 2021 Guidelines recommend no routine use of antihypertensives in the first 24 hours post stroke unless comorbid condition.

# Special circumstances to lower BP goals

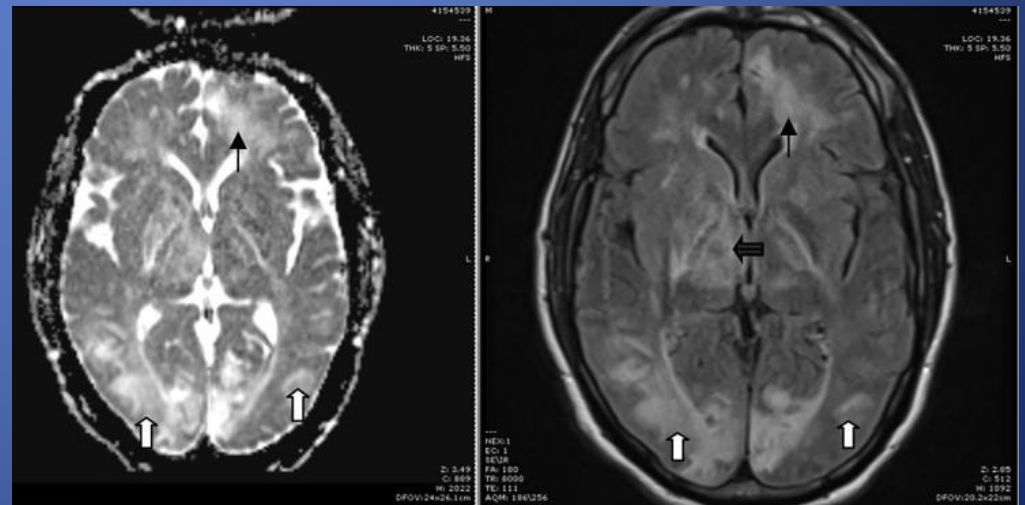
- Mixed ischemic stroke with ICH and/or SAH
  - SBP less than 140 is recommended. In cases of SAH, can consider lowering to SBP less than 160 to maintain cerebral perfusion
- Acute MI
  - Reducing BP helps reduce cardiac workload and myocardial demand. SBP less than 140 is a reasonable goal.
- Aortic dissection
  - SBP target is often less than 120

# Hypertensive urgency/hypertensive encephalopathy

- Can mimic stroke and be difficult to differentiate as BP is also elevated in ischemic stroke.
- Symptoms of hypertensive encephalopathy: severe headache, confusion, visual disturbances, dizziness. Signs are generally **nonfocal** compared to acute stroke.
- MRI can show changes including posterior reversible leukoencephalopathy syndrome (PRES) involving white matter of occipital and parietal lobes. Disruption of the blood-brain-barrier results in fluid extravasation from arteries and cerebral edema.
- AHA/ASA recommendation are given for patients who have elevated BP but are not eligible for thrombolysis to lower BP by 15% during the first 24 h after onset of stroke, usually if  $>220/120$ .



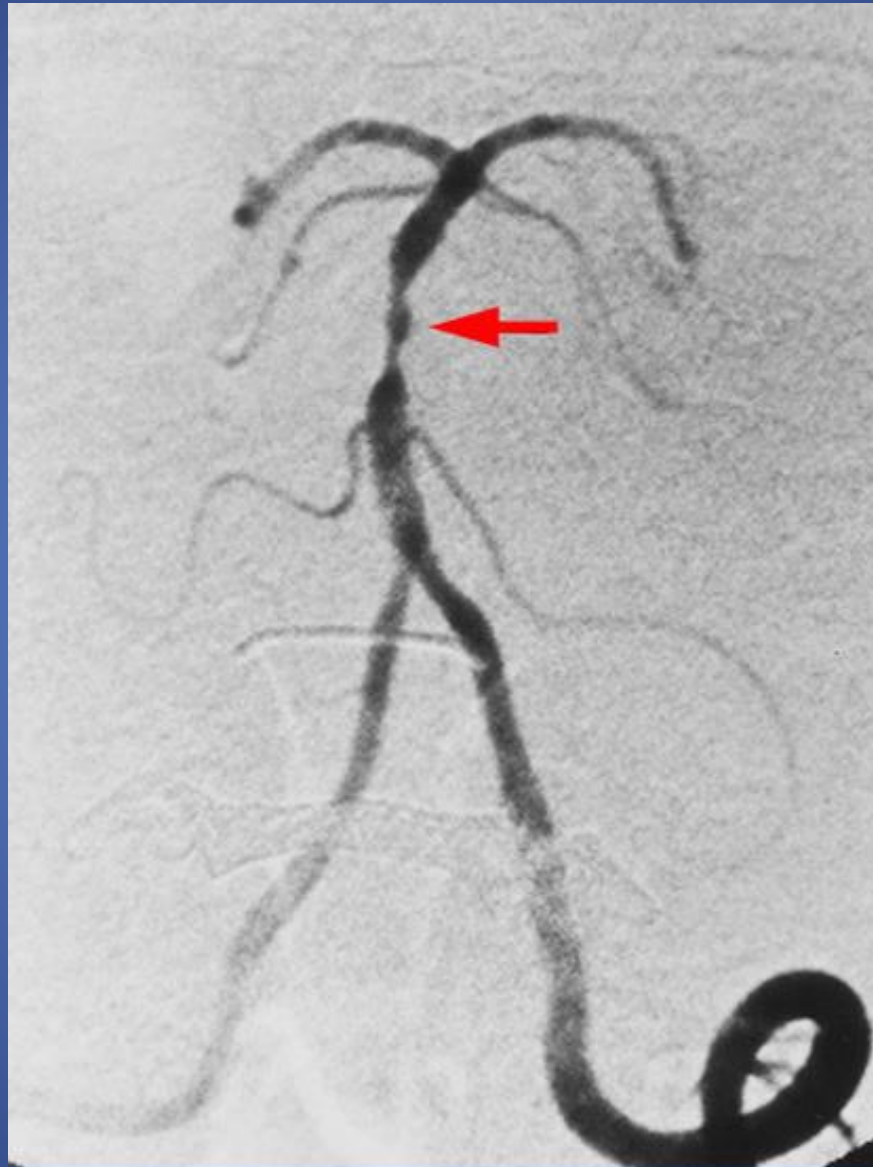
Hedna et al, *Int J Emerg Med* 2012



Frick et al, *Clin Pract Cases Emerg Med* 2017

# Special circumstances to raise BP goals

- Unsuccessful EVT: treat similar to stroke without intervention
- Pressor support: Can consider in situations with fluctuating or worsening neurological symptoms that are “pressure dependent”, LVO, or sustained hypotension.
- Choice of agent is heterogenous, but most often phenylephrine and then norepinephrine has been used across previous observational studies.



# Higher BP long term post stroke

- High grade arterial stenosis: due to atherosclerosis or vasculopathy such as moyamoya disease or fibromuscular dysplasia
- Neurological symptoms of lower pressure may be atypical: convulsions, “limb shaking TIA”, syncope in setting of posterior circulation stenosis
- Example goal long term could be 110-150/60-90

# Conclusions

- No treatment: BP less than 220/120. Avoid hypotension with SBP<120.
- IV thrombolytic: BP less than 185/110 prior to treatment. BP less than 180/105 for 24 hours post treatment.
- EVT: BP less than 180/105 prior to and post procedure. If LVO patient and unsuccessful EVT or not EVT candidate, can consider augmenting BP to maintain perfusion in acute setting.
- Long term: after 24 hours, can slowly reduce to target BP less than 130/80 in most cases.

# Questions?

- Call for help anytime!
- KU BAT phone: 913-588-3727
- <http://www.kissnetwork.us/>
- [sslavin2@kumc.edu](mailto:sslavin2@kumc.edu)