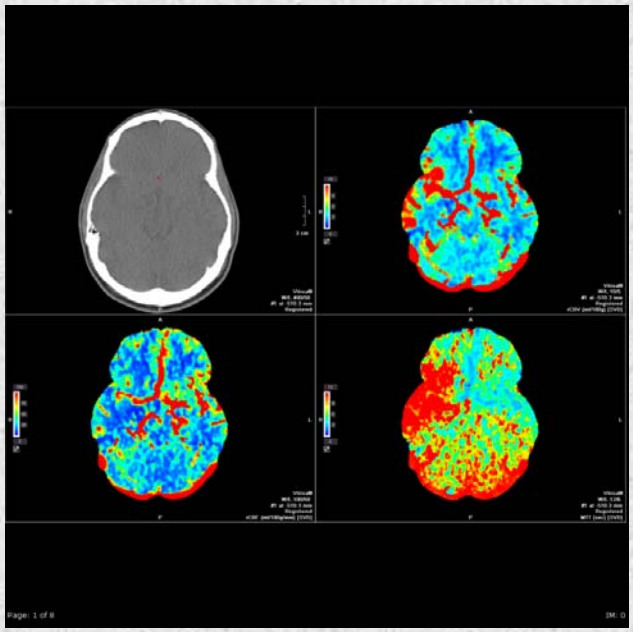

Stroke

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Objectives

- Understand the stroke alert process and be able to order the appropriate imaging tests for the patient with acute stroke.
- Know the evidence for IV-TPA in the management of acute ischemic stroke and the guidelines for its administration.
- Identify the circumstances in which catheter directed clot retrieval is indicated and when it is contraindicated.
- Understand the use of aspirin therapy in the management of acute ischemic stroke.
- Know the appropriate management of acute stroke in a patient who presents with atrial fibrillation.
- Describe the appropriate medical management of a patient with acute ischemic stroke.

Stroke

~795,000 strokes annually

5th leading cause of death

#1 cause of adult disability

80% of strokes are considered PREVENTABLE

What is a stroke?

- **Sudden** onset of a focal neurological deficit
- Stroke vs TIA?
- Definition
  - Brain, spinal cord or retinal cell death from ischemia

Our Volume

- 2018
  - 245 ischemic strokes
  - 105 IPH
- 60% transfers from outside hospital
- 80 IR EVT
- 68 IV tPA


Arizona's First Comprehensive Stroke Center
NEUROSCIENCE
The Brains of the Operation

3 phases in acute management of stroke

- Acute intervention
- Defining the etiology
- Identifying the needs moving forward
  - Medical management
  - Discharge needs

Acute Stroke

- Activate the stroke team
- tPA (alteplase)
- Endovascular treatment

Stroke team?

- Last time seen normal
- Stroke Alert
  - Rapid response first?
  - Do NOT get CT scan BEFORE calling stroke alert
  - Last seen normal within 6 hours?
  - Who is on the team?
    - Not just the neurologist…
      - CT clears and ready, radiology clears and ready
      - IR clears and holds
      - Lab
      - Nursing support
      - Transport
      - House sup.
      - ICU holding

What do we do first?

- Noncontrast CT of the brain
  - Hemorrhage
  - Big bad ugly stroke
- Physical examination
  - Identify the syndrome
    - Large artery occlusion
- Target history, med review


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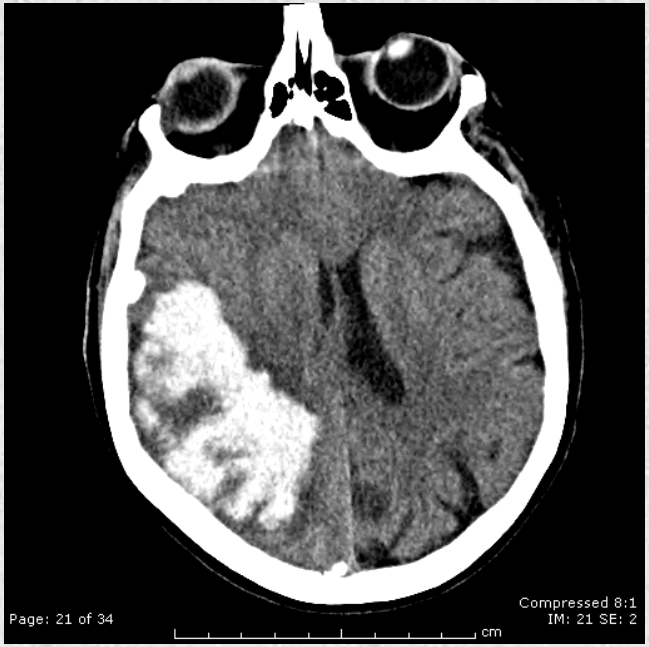
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tPA

- Normal head CT scan
- Dose 0.9 mg/kg MAX dose of 90mg
  - 10% as IV bolus, rest as an infusion

- Timeframes
  - 3 hour window
  - 4.5 hour window

Indications for tPA

Diagnosis of ischemic stroke causing measurable neurological deficit

even if mild

Onset of symptoms <4.5 hours before beginning treatment

Aged ≥18 years

To give tPA

- Blood pressure <185/110
  - Can treat to achieve
  - Maintained for 24 hours <180/105
- Oxygen therapy >94% if hypoxic
- Hypovolemia treatment with NS
- Normoglycemic (only needed lab for ALL patients prior to tPA)
  - >50 and <400 (okay to treat)
  - 140-180

Contraindications for tPA

May be harmful

- Prior ischemic stroke in last 3 months
- Recent intracranial or intraspinal surgery in last 3 months
- History of previous intracranial hemorrhage
- Recent gastrointestinal hemorrhage or malignancy (within previous 21 days)
- Intracranial neoplasm

Contraindicated

- Intracranial hemorrhage
- Severe head trauma in last 3 months
- Signs and symptoms most consistent with SAH
- Coagulopathy
  - Platelet count <100 000/mm3
  - INR >1.7, PT>15 sec
  - aPTT >40 sec
- Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (such as aPTT, INR, platelet count, and ECT; TT; or appropriate factor Xa activity assays)
  - Dose in last 48 hours
- Therapeutic dose of LMWH within last 24 hours
- Suspect infected endocarditis
- Suspect/known aortic arch dissection

IV rtPA Within 3 to 4.5 Hours From Symptom Onset

Relative exclusion criteria

- Aged >80 years
- Severe stroke (NIHSS>25)
- Taking an oral anticoagulant regardless of INR
- History of BOTH diabetes and prior ischemic stroke
- Stroke evident on CT >1/3 MCA territory

Other considerations

- Seizures
- Dural punctures
- Arterial punctures (noncompressable)
- Major surgery
- Trauma (not involving head)
- Recent gastrointestinal or urinary tract hemorrhage (within previous 21 days)
- Menstruation (menorrhagia)
- Giant unsecured aneurysm
- MI
- Pregnancy
- Systemic malignancy

Adverse events to tPA

Bleeding – IPH

Table 8. Management of Symptomatic Intracranial Bleeding Occurring Within 24 Hours After Administration of IV Alteplase for Treatment of AIS

Class IIb, LOE C-EO
Stop alteplase infusion
CBC, PT (INR), aPTT, fibrinogen level, and type and cross-match
Emergent nonenhanced head CT
Cryoprecipitate (includes factor VIII): 10 U infused over 10–30 min (onset in 1 h, peaks in 12 h); administer additional dose for fibrinogen level of <200 mg/dL
Tranexamic acid 1000 mg IV infused over 10 min OR ε-aminocaproic acid 4–5 g over 1 h, followed by 1 g IV until bleeding is controlled (peak onset in 3 h)
Hematology and neurosurgery consultations
Supportive therapy, including BP management, ICP, CPP, MAP, temperature, and glucose control

Angioedema

Table 9. Management of Orolingual Angioedema Associated With IV Alteplase Administration for AIS

Class IIb, LOE C-EO
Maintain airway
Endotracheal intubation may not be necessary if edema is limited to anterior tongue and lips.
Edema involving larynx, palate, floor of mouth, or oropharynx with rapid progression (within 30 min) poses higher risk of requiring intubation.
Awake fiberoptic intubation is optimal. Nasal-tracheal intubation may be required but poses risk of epistaxis post-IV alteplase. Cricothyroidotomy is rarely needed and also problematic after IV alteplase.
Discontinue IV alteplase infusion and hold ACEIs
Administer IV methylprednisolone 125 mg
Administer IV diphenhydramine 50 mg
Administer ranitidine 50 mg IV or famotidine 20 mg IV
If there is further increase in angioedema, administer epinephrine (0.1%) 0.3 mL subcutaneously or by nebulizer 0.5 mL
Icatibant, a selective bradykinin B_2 receptor antagonist, 3 mL (30 mg) subcutaneously in abdominal area; additional injection of 30 mg may be administered at intervals of 6 h not to exceed total of 3 injections in 24 h; and plasma-derived C1 esterase inhibitor (20 IU/kg) has been successfully used in hereditary angioedema and ACEI-related angioedema
Supportive care

Endovascular treatment

Endovascular Treatment

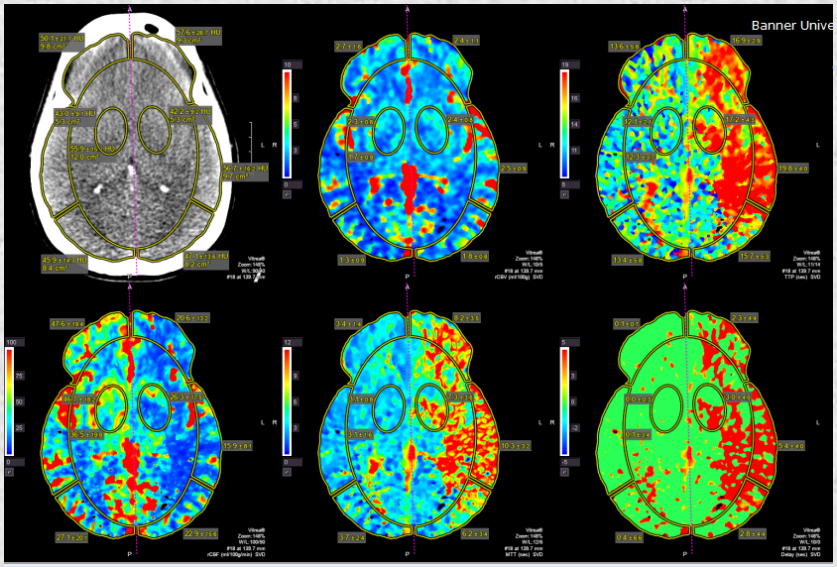
- 10-20% of stroke
- Give tPA if indicated
- Don't wait…
- Decrease stroke volume – save the penumbra
- Twice as likely to have a good outcome
- Decreased disability
  - ~50% reduction in disability rate
- 6 hour mark?

Guidelines

- Occlusion of ICA or proximal M1
  - BA, ACA, M2/3 branchs or PCAs may be considered
- Treatment initiated within 6 hours of symptom onset …
- Baseline MRS 0-1
- Age >18
- NIHSS > 6
- ASPECT score > 6 (imaging)

Endovascular up to 24 hours…

- Wake up stroke
- Stroke 6-24 hours from last seen normal
- CT brain ASPECT score >6
- Number to treat 2
- CT perfusion
  - Mismatch
  - DAWN
  - DEFUSE 3



Okay… now what?

NSICU

- Post tPA
- Post IR
- Hemodynamic instability
- Large volume stroke
- Exam instability
- Hemorrhagic stroke
  - Invite me back to talk about this

Routine Stroke

- Admit to 6B neuro tele
- OOU if ASYMPTOMATIC – all resolved
- Just order a stroke neurology consult
  - 602-521-3300
- NPO INCLUDING medications for nursing or SLP eval.
  - Meds either IV/PR or via DT

Diagnostic testing

- Goal is to identify etiology as well as for risks for stroke
- Imaging
  - MR brain WITHOUT contrast
  - CT angiogram (MRA only if contraindication to CTA)
    - Last resort carotid doppler US but let us consult first.
  - Echocardiogram
- Labs
  - A1C
  - Lipid profile
- Tele monitoring
- Use our order sets!

Assessing the damage

- Putting all the pieces together
  - Risks for stroke
    - Hypertension – the most important in secondary risk reduction
    - Hyperlipidemia
    - Diabetes
    - Smoking
    - Sleep apnea
    - Obesity
    - Inactivity
    - Drug abuse
    - Cardiovascular disease
    - And more…

First line medications

- ASA 325 mg or 300 mg PR – started by the 2nd midnight
  - Discharge on ASA 81mg daily UNCOATED unless otherwise specified in our note
- Lovenox or heparin for DVT prophy – started by the 2nd midnight
- Statin therapy – Atorvastatin 40 mg or 80 mg, can then be dose adjusted. Start when oral route cleared or DT placed.
- BP meds – acute BP goal <200/100
  - Depending on imaging, will start to normalize BP
    - 15% reduction if unstable

Classification of Stroke

Toast Criteria

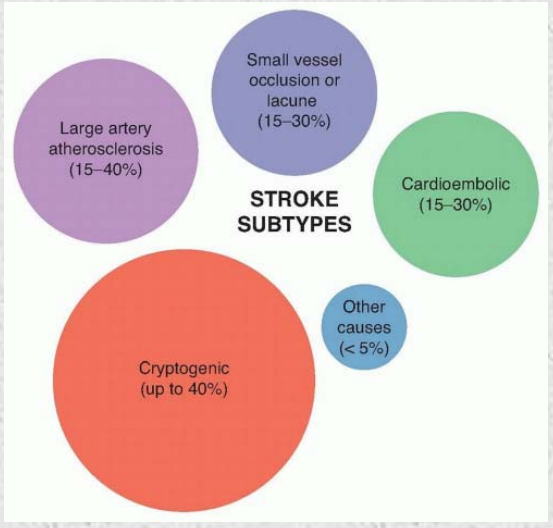
Cardioembolic

Large Artery Occlusive

Small Vessel Occlusive

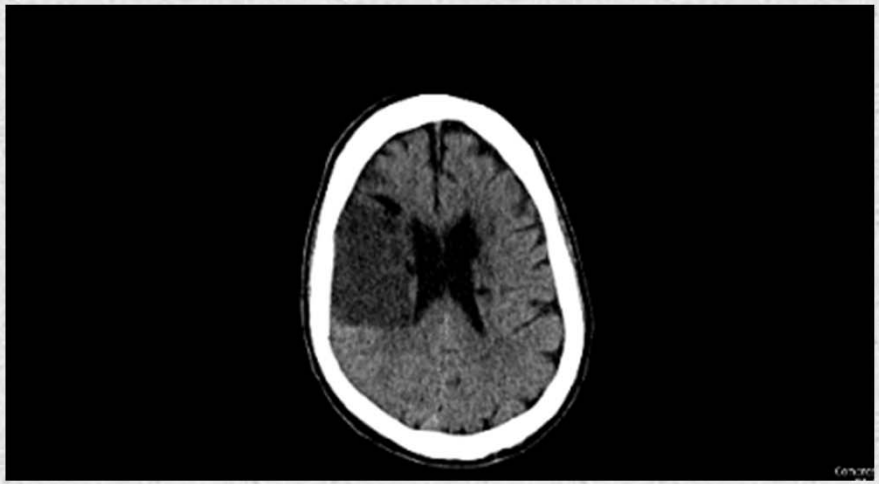
Other

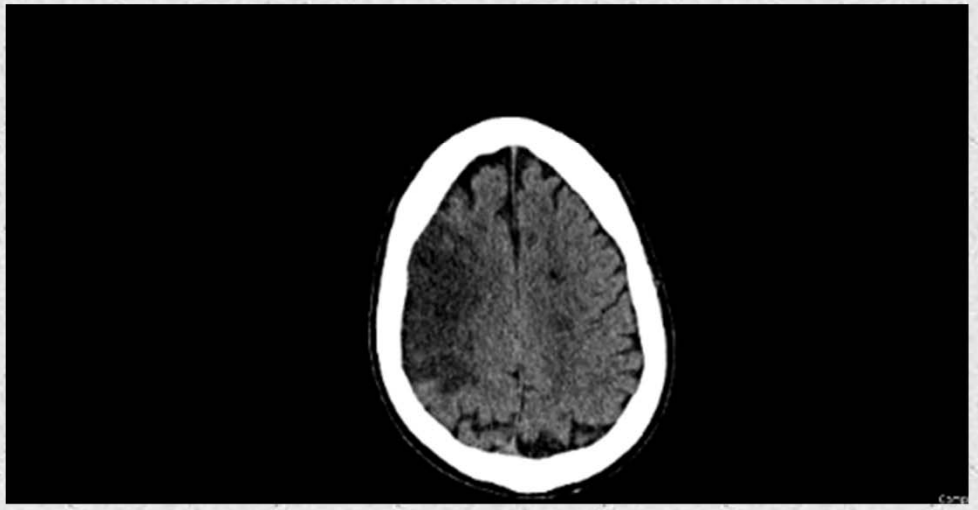
Cryptogenic

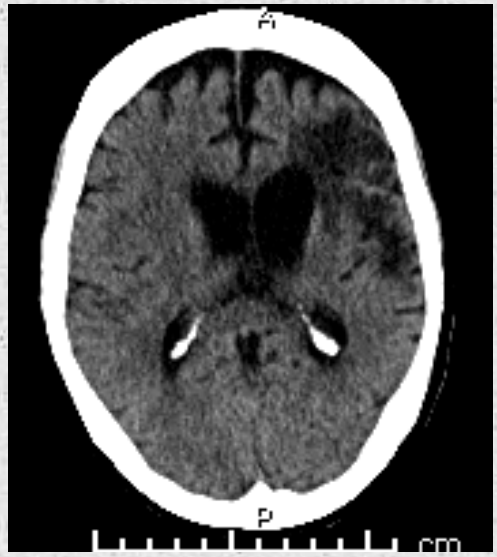


Cardioembolic stroke

- Atrial fibrillation
  - ASA for ~2weeks, then transition to oral anticoagulation
  - If have acute LA/LV thrombus – heparin gtts without bolus
- Rate management for hemodynamic stability
- Endocarditis, arch atheroma, cardiomyopathy, PFO



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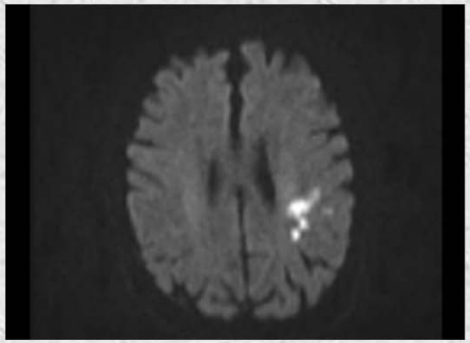
Cardioembolic advanced diagnostics

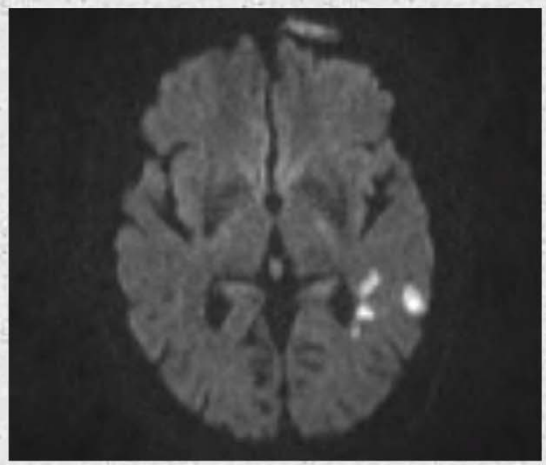
- TEE
- Cardiac CT
- LINQ placement

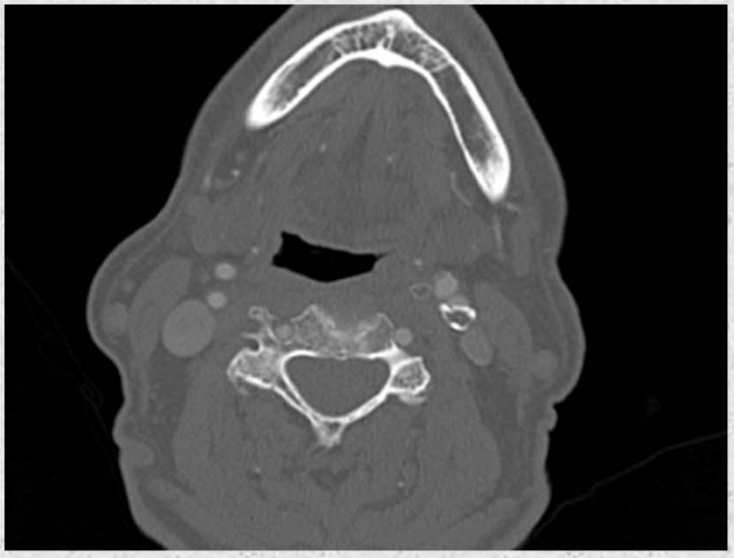
Figure 2: Reveal LINQ insertable cardiac monitor.

Large Artery Occlusion

- Carotid artery disease
  - Revascularization?
    - CEA vs stenting vs medical management
    - Now is the time
    - Moderate to severe stenosis
    - No intervention if occluded
- Intracranial stenosis
  - SAMMPRIS
    - MAXIMAL medical management
      - ASA 325mg +Plavix 75 mg daily for 3 months
      - High intensity statin
      - BP management
      - Lifestyle

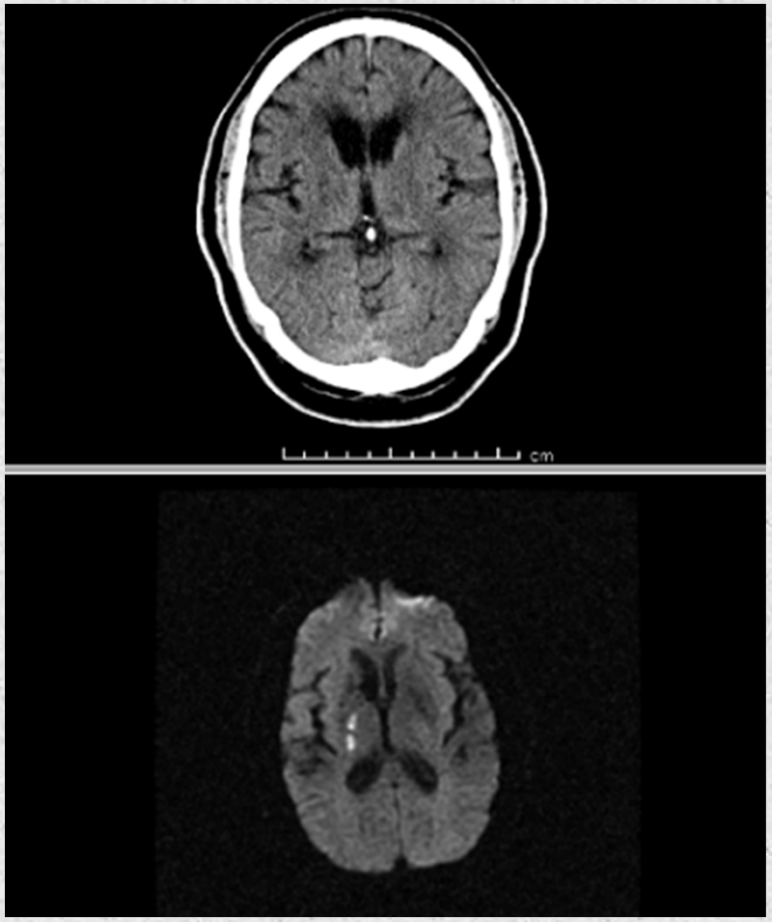






Small vessel

- Hypertension
- Diabetes
- Smoking



Assessing the damage

- Physical therapy
- Occupational therapy
- Speech therapy
- Music therapy
- Pet therapy
- Acute rehab
- SNF

- Typically in our clinic in 1-3 months – outcome measurements evaluated. READ OUR LAST NOTE
- Need a PCP!
- Sleep studies
- Outpatient cardiac evaluations
- Dispo medications –
  - Antiplatelet (or OAC)
  - Statin
  - BP medications
  - DM management