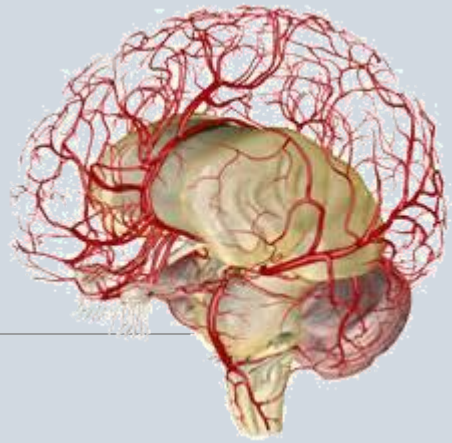
Georgia Stroke Core Curriculum



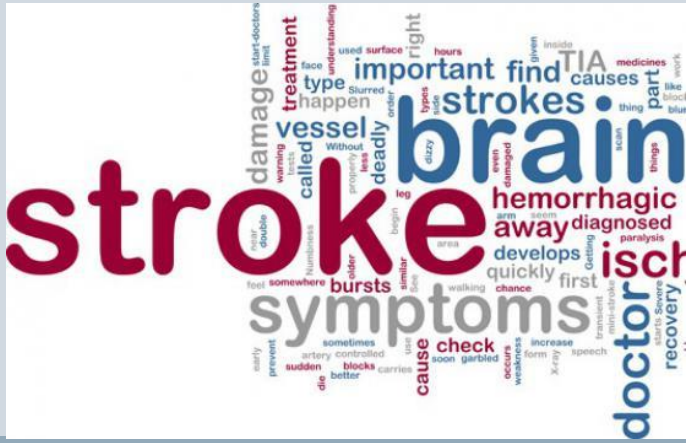
GEORGIA STROKE CURRICULUM

EMS Field and Emergency Management

GEORGIA STROKE CURRICULUM

Objectives

- Prioritize field management for acute strokes
- Understand various stroke scales
- Establish Code Stroke Alert–best practices

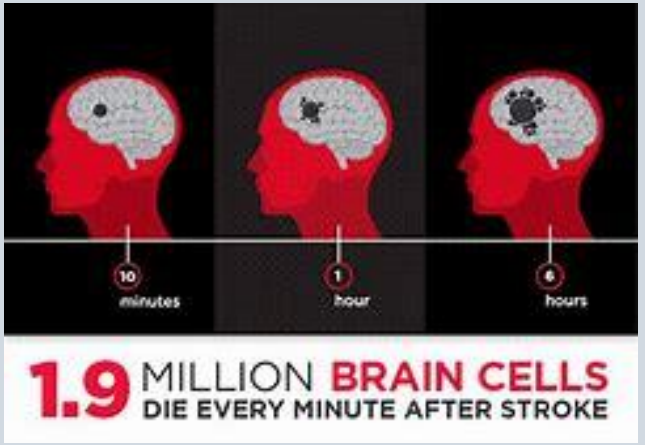


AHA/ASA Practice Guidelines

- EMS Strategies within Stroke Systems of Care
- Activating and dispatching stroke at highest priority
- Stroke is an EMERGENCY
  - Treat Stroke patients the same as Trauma or STEMI
- Pre-notification to the receiving facility
- Use protocols and standardized assessment tools
- Transport RAPIDLY to closest ASRH, PSC, TSC or CSC

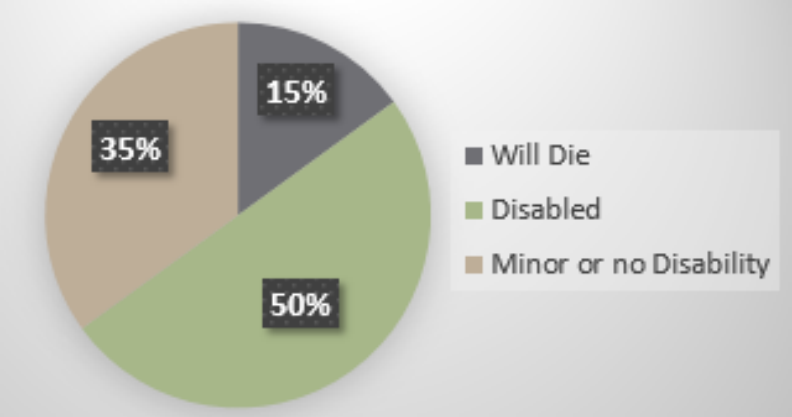
Stroke is an Emergency!

- Number one cause of Disability
- Fifth leading cause of Death
- Occurs every 40 seconds
- Someone dies every 3-4 minutes
- In-house strokes: 6.5%-15%
- In house strokes mortality: 36-60%
- Indirect and direct cost is estimated at $75 billion



Definition of a Stroke

- Interruption of blood supply to part of the brain caused by blockage or rupture of an blood vessel
  - Decreased cerebral blood flow leads to decreased perfusion
- Acute vascular event with sudden onset of focal neurological deficits related to a vascular territory
- Progressive cell death due to lack of oxygen and glucose
- Out of all stroke patients →



Chain of Survival & Recovery

Detection: Rapid recognition of stroke symptoms

Dispatch: Early activation of EMS & call 911

Delivery: Rapid EMS identification, management & transport

Door: Appropriate triage to stroke center

Data: Rapid triage & evaluation in ED

Decision: Stroke expertise and therapy selection

Drug: Inclusion/Exclusion fibrinolytic/endovascular

Disposition: Rapid admission to appropriate stroke unit

Stroke Assessment

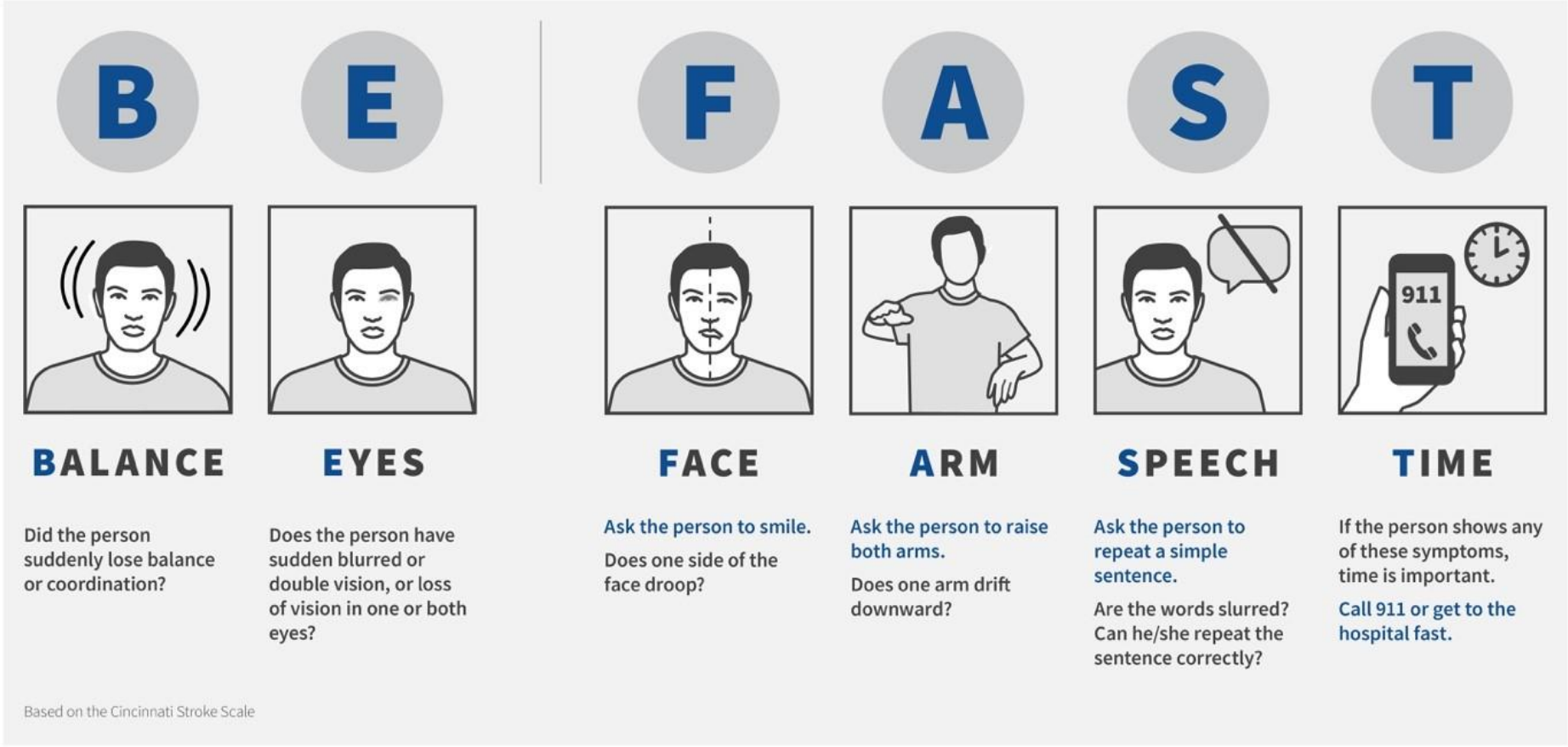
Field Management: Basic Screening

- Cincinnati Prehospital Stroke Scale (CPSS)

Large Vessel Occlusion (LVO) Stroke Severity Tools:

- Miami Emergency Neurological Deficit (MEND)
- Rapid Arterial Occlusion Evaluation (RACE)
- Los Angeles Prehospital Stroke Screen (LAPSS)
- FAST – ED (Eye Deviation/Denial)
- BE – FAST (Balance/Eye-Vision)
- VAN (Vision, Aphasia, Neglect)

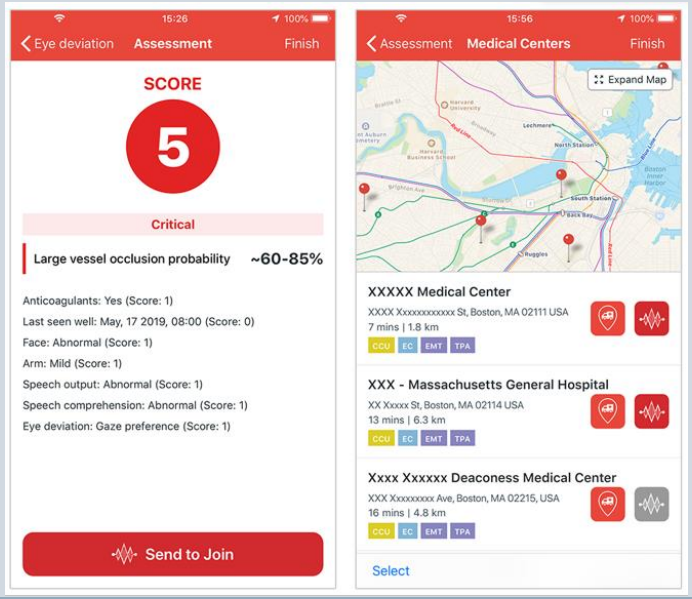
B.E. | F.A.S.T.



https://www.strokeawareness.com/hcp/resources/download-stroke-resources.html

Face **A**rm **S**peech **T**ime,
Eye deviation & **D**enial/Neglect

- EMS screening application
- Developed by Grady Memorial Hospital in Atlanta
- Symptoms indicative of a large vessel occlusion
- **FAST- ED**



Mobile Stroke Unit

Prehospital Evaluation & Management

Recommended

- Assess and manage ABC's
- Initiate cardiac monitoring
- Do not administer excessive intravenous fluids : only NS
- Provide oxygen to maintain O_2 saturation > 94% (NC 2-4 l/m)
- Establish IV access
  - 2 if possible/preference 18g right and left AC
- Determine BG & treat if less than 60 mg/dl per protocol

Maintain NPO*:* Dysphagia increases the risk of mortality by 30%

Prehospital Evaluation & Management

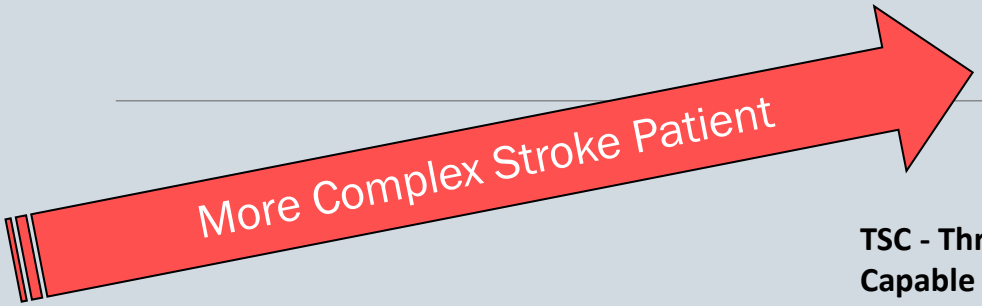
Recommended

- Head of Bed maximum of 30 degrees
- Head alignment straight
- Determine Last Known Normal (LKN)
- Do NOT treat Blood Pressure in the field
- Rapid transport to nearest ASRH, PSC, TSC or CSC
  - Load and Go 12 Lead EKG in route
- Pre hospital notification (Code Stroke Alert)
- Screen for fibrinolytic contraindications

Last Known Normal (LKN)

- Patient's baseline
  - Previous stroke deficits, normal mental status
- Identifiers of LKN
  - State actual time and day
  - Meals, TV shows, phone calls, texting, etc
  - Symptom Discovery vs LKN – not always the same
  - Obtain Family or Witness contact information
- Wake up Strokes
  - Time patient went to bed
  - Getting up during the night
  - How patient is dressed

Designation of Stroke Centers



ASRH - Acute Stroke Ready Hospital

- IV thrombolytics
- Acute Stroke Team with Neurology accessible 24/7
- Telemed w/in 20 minutes
- Diagnostic Services
- Utilize Disease –Specific Care Standards & track, monitor, report performance measures
- Implement Clinical Practice Guidelines (CPG's)
- Transfer agreements – part of stroke network

PSC - Primary Stroke Center

❖ **Same as ASRH Plus**

- IV thrombolytics
- Designated stroke beds

TSC - Thrombectomy – Capable Stroke Center

❖ **Same as PSC Plus**

- Minimum of 15 endovascular cases annually or 30 in two years
- Specific standards for neurointerventionist

CSC - Comprehensive Stroke Center

❖ **Same as TSC Plus**

- Min volume of IV Alteplase: 25 SAH: 20 with 15 coil/clip yearly
- Advanced Neuro Imaging 24/7
- Interventional services 24/7 with a dedicated Neuro ICU for complex stroke patients
- Ability to meet concurrent needs for two complex stroke patients 24/7
- Neurosurgical services 24/7
- Post-hospital coordination of Care with 90 day f/u of outcomes (mRS)
- Patient Centered Research approved by Institutional Review Board (IRB)

Goal: *Stroke patients dispatched to the highest level of care available in the shortest time possible.*

EMS and ED Collaboration

- Know your Stroke Champions
- Travel to CT with patient on cardiac monitor
- Respect is key between EMS and ED Staff/Providers

EMS to ED Provider Handoff

- Chief Complaint/Vital Signs/Blood Glucose
- STROKE assessment – neurologic deficits
- Onset of symptoms in hours: minutes
  - LKN differentiate between Witnessed vs. Non-Witnessed
- Patient's medication – Anticoagulants
  Coumadin, Pradaxa, Xarelto, Eliquis, Savaysa
- Family or witness info/cell phone numbers

EMS Quality Metrics
GA-Coverdell Stroke Registry

Document Quality Metrics on Patient Care Report (PCR)

- First Medical Contact (Median 6 minutes)
- On scene Time < 15 minutes
- Code Stroke Alert called from the field
- Last Known Normal vs. Symptom Discovery Time
- Blood Sugar
- Stroke Scale
  - Describe stroke symptoms (CPSS/FAST-ED)

American Heart Association | American Stroke Association

Protecting Georgia's Minds

Georgia Coverdell Acute Stroke Registry

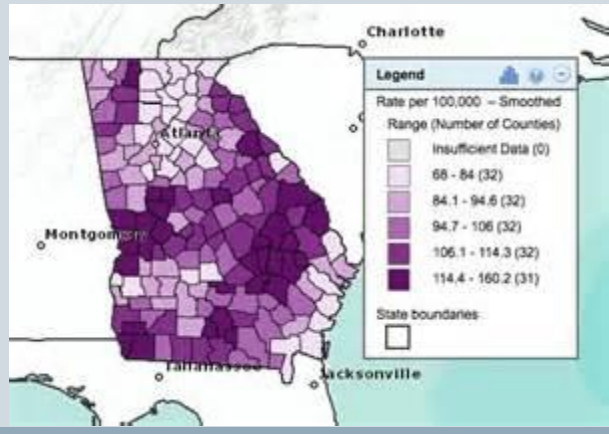
EMS Community Education

- Stroke systems of care begins with public education
- Recognize signs and symptoms (BE-FAST) call 911
- Understand Stroke prevention strategies
  - Hypertension # 1 risk factor to control
  - CHF + CAD doubles the risk of stroke
  - Don’t Smoke (includes E-cigarettes)
  - Daily Exercise
  - Control Diabetes

Activation of EMS is the most important action to emphasize in community education that directly improves outcomes and disability

80% of Strokes are Preventable

- Monitor and Control Blood Pressure
- Smoking (includes E-cigarettes)
  - + Oral contraceptives increases risk
- Monitor and Control Blood Glucose
- Monitor and Control Blood Cholesterol
- Heart Healthy Diet (be at a healthy weight)
- History of A-Fib or recent MI
  - Antithrombotic /Anticoagulant as directed
- Alcohol in moderation
- Exercise Daily
- Annual medical check-ups/physicals



Questions – Thank You

Emergency Management

GEORGIA STROKE CURRICULUM

ED Acute Stroke Management

- Manage vital sign parameters
- Imaging diagnostics
- Neurological assessment
- Consult stroke expert (Telestroke)
- Determine etiology
- Appropriate treatment
- Decrease medical complications
  - Avoid giving glucose (Unless BG <60 mg/dl)
  - Avoid treatment of HTN
    - Unless > 220/120 mm Hg or fibrinolytic candidate
  - Avoid aspiration (dysphagia screen follow protocol)
  - Provide oxygen to maintain O_2 saturation > 94% (NC 2-4 l/m)
  - IVF's – Normal Saline only
  - Standardized stroke protocols (AIS, SAH, ICH)

NIH Stroke Scale (NIHSS)

- Validated tool and best practice
- Predictor of long-term outcome
  - NIHSS > 25 high probability for morbidity and mortality
- Communication tool between providers
- May not be feasible to perform in prehospital setting
- Measures neurological functional improvement over time
- Providers certified a minimum of every 2 years

NIH Stroke Scale Score	Stroke Severity
0	No stroke symptoms
1-4	Minor stroke
5-15	Moderate stroke
16-20	Moderate to severe stroke
21-42	Severe stroke

Transient Ischemic Attack (TIA)

- Brief episode of neurological dysfunction caused by focal brain or retinal ischemia
- Clinical symptoms typically lasting less than one hour
- No evidence of acute infarction
- 90% clear within 10 minutes
- Most common cause is thromboembolism
- Find the cause and treat – prevent future strokes
  - 10% have a stroke w/in 2 days
  - 15% have a stroke w/in 7 days
  - 25% have a recurrent “event” w/in 3 months
  - 25% expire at one year

ABCD² Score

Risk Assessment Scale Predictor 2 – 90 Day Risk of Stroke after TIA

Risk Factor	Value	Score
Age	>/= 60 years	1
Blood Pressure	SBP > 140 or DBP > 90	1
Clinical Symptoms	Unilateral Weakness Speech disturbance w/o weakness	2 1
Duration of Symptoms	➢ 60 min ➢ 10-59 min	2 1
Diabetes	Oral Medication or insulin	1

Score 0-3:
1% risk of stroke in 2 days
5% in 90 days

Score 4-5:
4% risk of stroke in 4 days
8-12 % risk in 90 days

Score 6-7:
8% risk for stroke in 2 days
17 – 22 % in 90 days

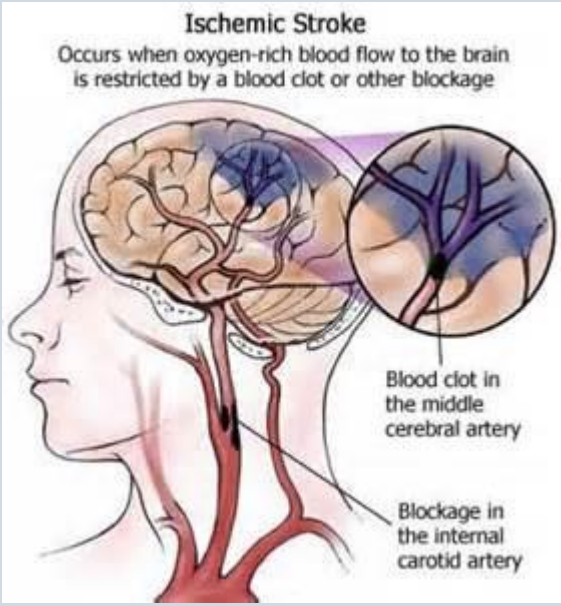
Score 4-7:
Consider for hospital admission

Ischemic Strokes

87% of all strokes are Ischemic most common cause Thromboembolism

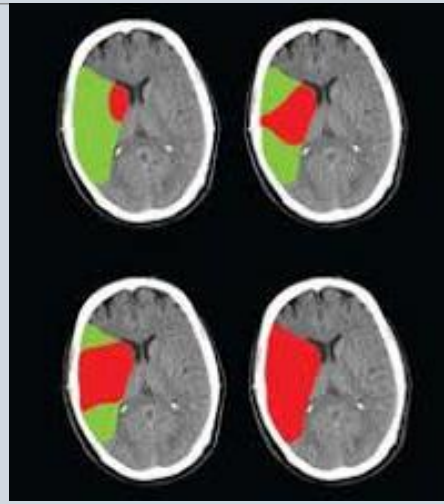
Large vessel, small vessel, atheroembolic, cardio embolic

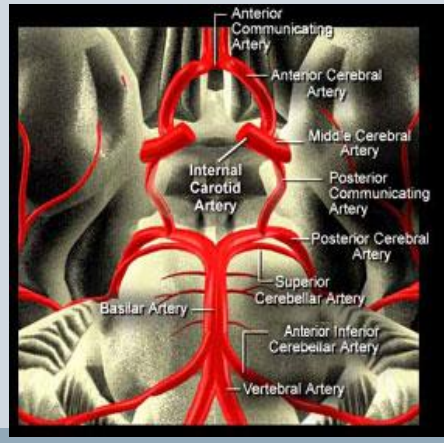
- 20% atherosclerotic cerebrovascular disease from hypoperfusion or arteriogenic emboli
- 20% cardiogenic embolism
  - CRYSTAL AF trial median time 84 days
- **25% lacunar, subcortical (small vessel)**
- 30% cryptogenic (unknown etiology)
  - Embolic Stroke Undetermined Source (ESUS)
- 5% other – dissections, arteritis, vasospasm, drug abuse, hypercoagulable state



Save the Penumbra!

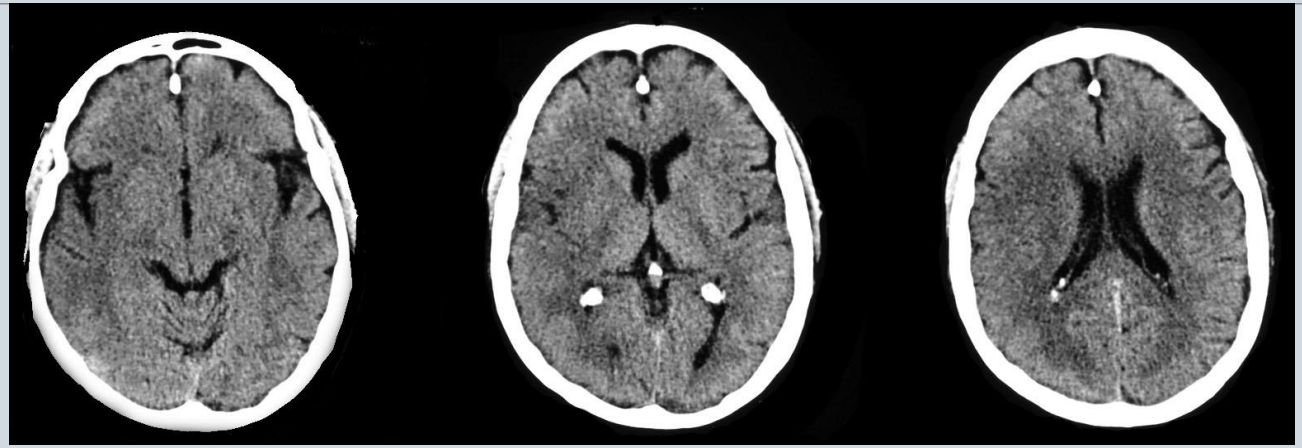
- Zone of salvageable tissue, compromised neuronal cells, unable to function but viable
- Located around the area of core infarct
- Will reverse if flow is reestablished
- Variables affecting the penumbra
  - Time to fibrinolytic delivery/endovascular
  - Collateral flow
  - Site occlusion location (clot burden)
  - BP control (tight and slow)
  - Seizures, Hypotension, Hyperglycemia, Fever



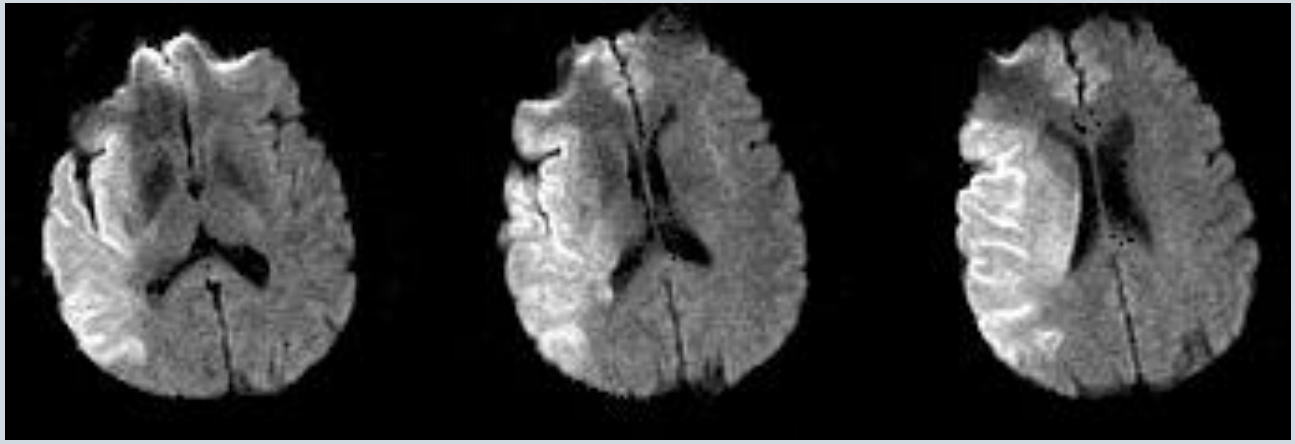


Acute Infarction: CT and MRI

CT

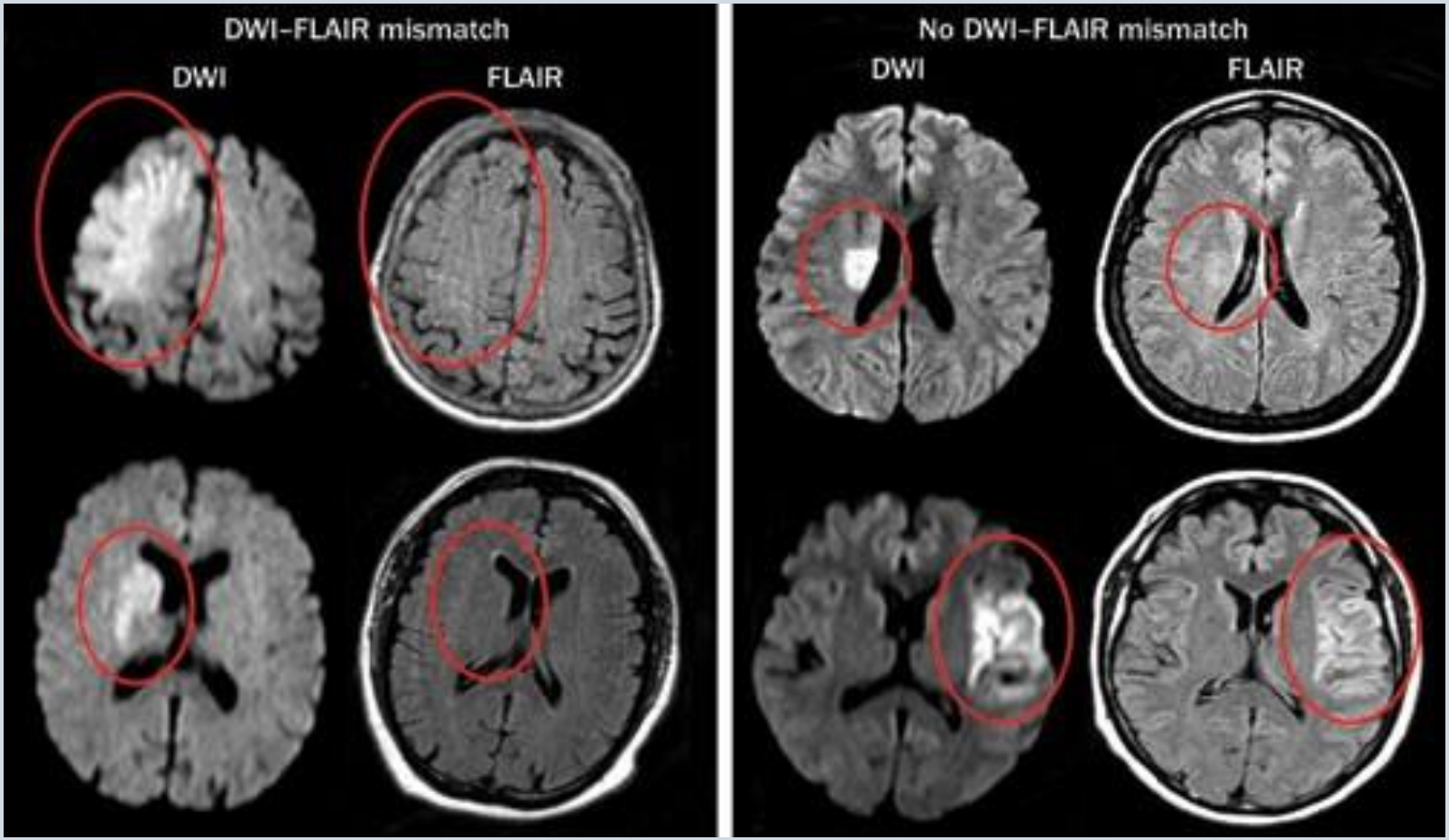


DWI



DWI – FLAIR Mismatch

Greater than 4.5 hours from LKN



Eligibility required MRI mismatch between abnormal signal on DW-MRI and no visible signal change on FLAIR

Acute Ischemic Stroke Treatments

Time sensitive

- IV fibrinolytic
  - 0 – 4.5 hour window
- Endovascular intervention
  - 0 – 24 hour window
- Secondary Prevention
  - Antithrombotic therapy started in ED
  - ASA 325 mg PO or 300 mg suppository
  - ASA allergy need alternate antiplatelet
    - Plavix, Brilinta, Effient, etc.

Patients need to Walk and Talk themselves out of Alteplase

Screen for IV-Alteplase Criteria

- Current evidence of intracranial hemorrhage on non-contrast head CT
- High clinical suspicion or any indication of subarachnoid hemorrhage
- Presence of intracranial conditions that may increase the risk of bleeding (e.g., some neoplasms, arteriovenous malformations, or aneurysms)
- Recent (within 3 months) intracranial or spinal surgery, serious head trauma
- Uncontrolled blood pressure (systolic > 185mm Hg or diastolic > 110 mm Hg)
- Active internal bleeding
- Bleeding diathesis, including but not limited to:
  - Full treatment Heparin within 24 hours, resulting in elevated aPTT > 40 seconds
  - Current DOAC dose within 48 hours (confirm when last dose taken and document)
  - Current use of anticoagulant with INR > 1.7 or PT > 15 seconds
  - Platelet count < 100,000/mm^3

Comparison of Oral Anticoagulants

Characteristic	Warfarin (Coumadin)	Dabigatran (Pradaxa)	Rivaroxaban (Xarelto)	Apixaban (Eliquis)	Edoxaban (Savaysa)
Site of Action	Vitamin K antagonist	Direct Thrombin inhibitor (IIa)	Factor Xa inhibitor	Factor Xa inhibitor	Factor Xa inhibitor
Time of onset	4-5 days	1-2 hours	2-4 hours	3 hours	1-2 hours
Half-life	**2-5 days**	**12-17 hours**	**5-9 hours**	**8-14 hours**	**10-14 hours**
Renal Excretion	none	Renal (80%)	Renal (33%)	Renal (25%)	Renal (50%)
Dosing Frequency	Daily	BID PraxBind (Idarucizumab) IV reversal	Daily Andexxa (Andexanet alfa) IV reversal	BID Andexxa (Andexanet alfa) IV reversal	Daily

Clinical Practice Guidelines (2019 CPGs)

- Age greater than 80 is safe and effective (IIa recommendation)
- History of stroke and diabetes is as effective as 0-3 hour window, reasonable option (IIb recommendation)
- Taking Warfarin (Coumadin) and INR ≤ 1.7 is safe and beneficial (IIb recommendation)
- NIHSS > 25 is uncertain (IIb recommendation)
- Mild and Rapid Improvement may be effective and reasonable option (IIb recommendation)
- Preexisting disability (mRS ≥2) may be reasonable, considering social/care support and goals of care (IIb recommendation)
- Preexisting dementia may be clinical meaningful, considering premorbid level of function and life expectancy (IIb recommendation)

"It's only a mild stroke if YOUR not the one having it!"

Target Stroke: AHA-Suggested Time Interval Goals

Action	30-min DTN time interval goal, min	45-min DTN time interval goal, min	60-min DTN time interval goal, min	90-min DTD time interval goal, min
Door to physician	≤2.5	≤5	≤10	≤5
Door to stroke team	≤5	≤10	≤15	≤10
Door to CT/MRI initiation	≤15	≤20	≤25	≤20
Door to CT/MRI interpretation	≤25	≤35	≤45	≤35
DTN	≤30	≤45	≤60	≤45
Door to neurointerventional team activation				≤40
Door to patient arrival in NIR suite				≤60
Door to puncture				≤75
DTD				≤90

AHA indicates American Heart Association; CT, computed tomography; DTD, door to device; DTN, door to needle; MRI, magnetic resonance imaging; and NIR, neurointerventional team/suite.

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Reduction in DTN times has the most significant impact on patient outcomes

IV-Alteplase
Dosing & Administration for Stroke

- Dosing: Weight based
  - 0.9mg/kg, maximum dose of 90mg
  - 10% of total dose administered in IV bolus over 1-2 minutes
  - Remaining 90% of dose administered over 1 hour
- Mixture
  - 100 mg powder, 100 cc sterile water
  - Puncture both bottles, water drips into powder bottle
  - Do not shake, gently swirl
  - If administered directly from bottle, vent IV tubing
- Give through a dedicated line
- Follow with 50 cc Normal Saline at the SAME rate

https://www.activase.com/ais/resource-center/video-library.html

IV-Tenecteplase Dosing & Administration for Stroke

- Dosing: Weight based
  - 0.25 mg/kg IV once
  - Max dose 25 mg
  - Reconstitute vial to final concentration of 5 mg/ml
- Administered as an IV bolus over 5 seconds
- Incompatible with dextrose
- Flush line with normal saline before and after administration

tenecteplase (TNKase) for Stroke Panel — Accept

If using this tenecteplase panel outside of order set for treatment of Acute Stroke, please use Ischemic Stroke Admission With Thrombolytic Therapy order set (3040000239) instead. Order set includes orders for tenecteplase.

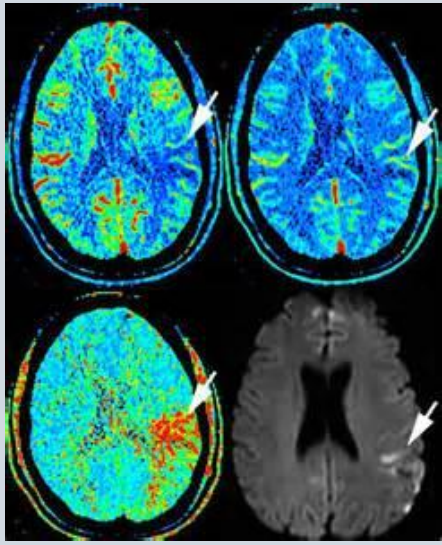
- tenecteplase (TNKase) 19 mg injection 3.8 mL
  19 mg (0.25 mg/kg × 76 kg), Intravenous, Once, today at 1500, For 1 dose
  Dilute 50 mg vial with 10mL of sterile water. Swirl gently to mix. Draw up appropriate dose, discard remainder. Administer IV push over 5 seconds. Flush dextrose containing lines with NS before and after administration to avoid precipitation.
- sodium chloride 0.9 % (NS) flush
  10 mL, Intravenous, See admin instructions, Starting today at 1437, For 2 doses
  Flush line with NS before and after administration of tenecteplase (TNKase). INT Flush

Next Required — Accept

Fibrinolytic Protocol

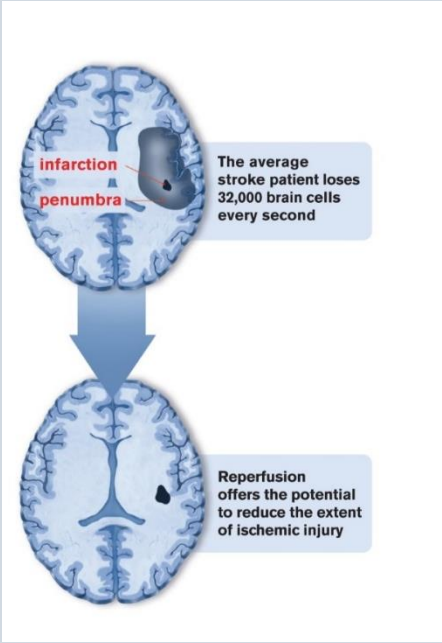
V/S and Neuro Check prior to bolus (within 15 minutes)

- NINDS protocol = Q 15 min x 2 hours, Q 30 min x 6 hours and Q 1 hour x 16 hours for the first 24 hrs
- Maintain BP at or below 180/105 mm/Hg
  - Improves thrombolytic success and patient outcomes
  - Do not lower BP aggressively
- Patient Positioning
  - HOB lowered if not at aspiration risk
  - HOB elevated 30 degrees to decrease ICP
- ICU/Cardiac monitoring
- No aspirin, heparin or oral anticoagulation for 24 hours



Fibrinolytic Complications

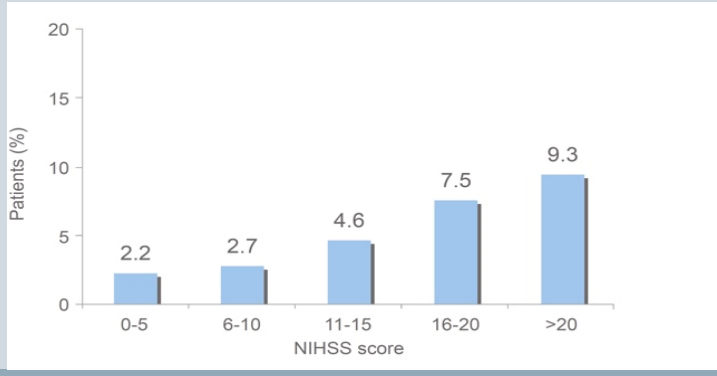
- Monitoring for neurological decline or worsening symptoms
  - Agitation, Restlessness
  - Spike in blood pressure
  - Nausea/vomiting
  - Headache
    - Document baseline pain score prior to bolus
- If Neurological Decline occurs
  - First Priority Stop the Infusion
  - Re-check BP to goal 180/105
  - Contact physician
  - Obtain Stat NCCT head scan
  - Complete NIHSS



Alteplase Infusion may be restarted at same rate (no bolus)
if NCCT head is negative for hemorrhage per MD order

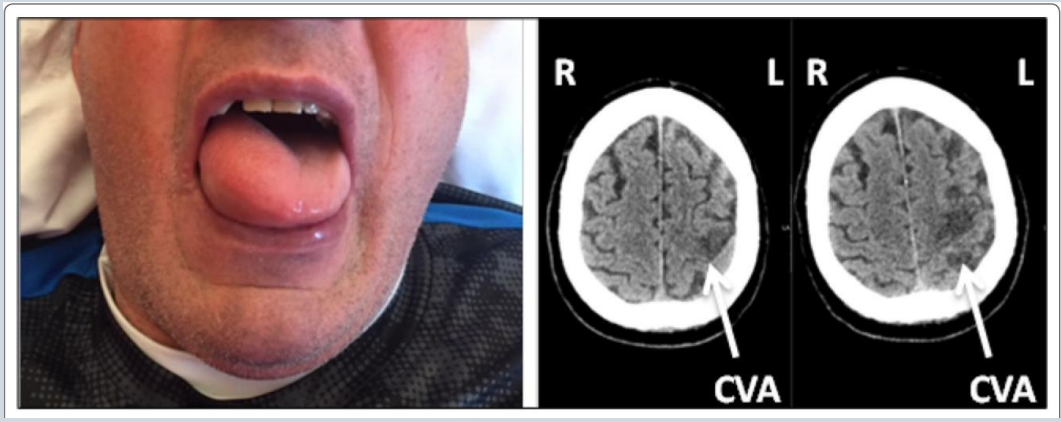
Complication: Hemorrhagic Conversion

- Considered fibrinolytic complication within 36 hours of infusion
  - More often less than 8 hours
- Labs
  - PT/PTT, Fibrinogen level, Type/Cross Match
- Protocol may include
  - PCC (Prothrombin Complex Concentrate) Kcentra
  - Amicar (aminocaproic acid) or Tranexamic Acid (anti-fibrinolytic)
  - Cryoprecipitate (10 units/30 min)
  - Platelets (Volume!!)
  - Consult Neurosurgeon/Hematology
  - Supportive care



Complication: Angioedema

- Occurs in up to 5% of patients
- Associated with ACE inhibitor use or allergy
- Baseline assessment of tongue
- Observe for facial, tongue, or pharyngeal angioedema up to 24 hours



Treatment

- Benadryl 50 mg IV
- Pepcid 20 mg IV
- Methylprednisolone 125 mg IV
- IF further increase in Angioedema give EPI (0.1%) 0.3 ml subq or 0.5 ml nebulizer
- Monitor for risk if ICH secondary to increase BP

IV Fibrinolytic EMS Transfer protocol

- Obtain/record VS & neuro checks every 15 min
- Infusion completed in 60 min after start
- Flush tubing with NS at same rate
- No other drug through infusion line
- BP management
  - Maintain BP < 180/105
- Strict NPO
- HOB ≤ 30 degrees
- Provide oxygen to maintain O_2 saturation > 94% (NC 2-4 l/m)
- Know complications

STOP Alteplase for: Worsening LOC, Severe H/A, Acute HTN, N/V

Hemorrhagic Strokes

13% of all strokes are Hemorrhagic

Intra**c**erebral **H**emorrhage due to **C**hronic **H**TN (**ICH 10%**)

- Decrease LOC
- Confusion/Agitation
- Hemiparesis

Subar**a**chnoid **H**emorrhage due to an **A**neurysm rupture (**SAH 3%**)

- Worst headache of my life or "Thunderclap Headache"
- Decreased LOC
- Nausea and vomiting
- Photophobia (intolerance to light)
- Neck stiffness front to back (not side to side)

Hemorrhagic Reversal Agents

- Correct Coagulopathies
  - Severe thrombocytopenia: low platelets/cancer patients
  - Anticoagulation reversal to prevent hematoma expansion
- Coumadin/Warfarin: Vitamin K
- Tranexamic Acid 1000 mg IV or Aminocaproic Acid 4-5 g IV
- Prothrombin Complex Concentrate (PCC): (Kcentra)
  - Factors II, VII, IX, and X
  - No type & cross match is required, no volume overload
- Cryoprecipitate: 10 units over 10-30 mins
- Fresh Frozen Plasma (FFP)
  - Must have type & cross match, volume overload
- Praxbind (idarucizumab) IIA inhibitor for Pradaxa (Dabigatran)
- Andexxa (andexanet alfa) XA inhibitor for Eliquis and Xarelto

Acute Stroke Care – Standard Work

- **Blood Pressure Management**
  - Acute Ischemic Stroke (AIS) w/o IV Alteplase ≤ 220/120 mmHg
  - Acute Ischemic Stroke (AIS) w/ IV Alteplase ≤ 180/105 mmHg
  - Intracerebral Hemorrhage (ICH) range 130 – 150 with goal of 140 SBP
  - Subarachnoid Hemorrhage (SAH) ruptured < 160 SBP
  - Aneurysm unruptured < 140 SBP
- **O_2 saturation > 94% (NC 2-4 l/m)**
- **Euvolemia: 75-100 ml/hr Normal Saline**
- **Dysphagia screen prior to anything by mouth; includes medication**
- **Blood Glucose Management (< 60 or > 180 mg/dl)**
- **Normothermic 37ºC or 98.6ºF**

(Follow hospitals specific protocols)

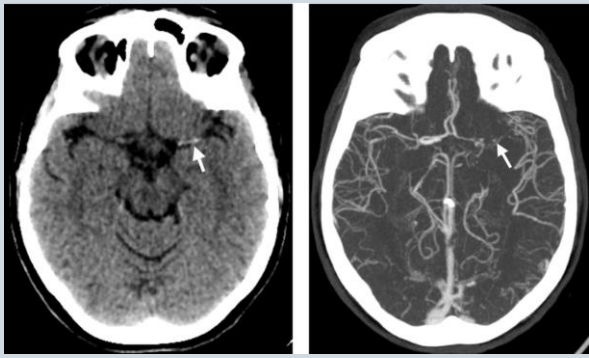
Priority first 24 hrs. is frequent assessment of neurological status

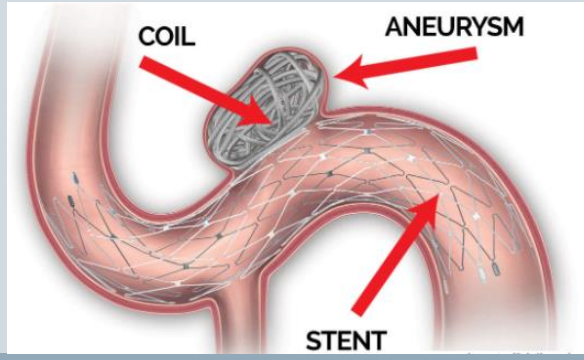
Comprehensive Stroke Center Services

GEORGIA STROKE CURRICULUM

Endovascular Stroke Treatment

- Comprehensive Stroke services
  - Thrombectomy
  - Coiling and clipping for SAH and aneurysm
  - Treatment of AVM, Neuroendovascular stenting
  - Neurosurgical intervention for ICH
  - Research
- Thrombectomy Capable/PSC Plus Centers



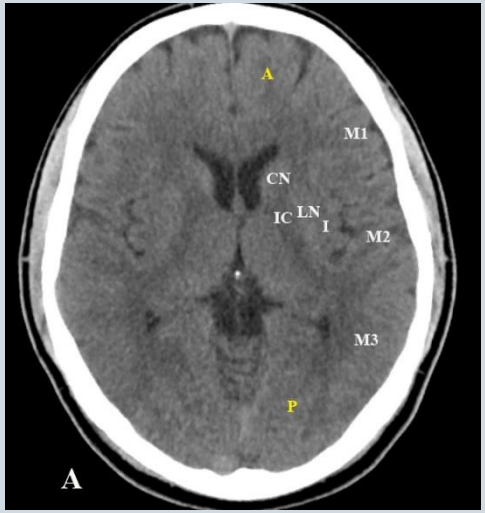


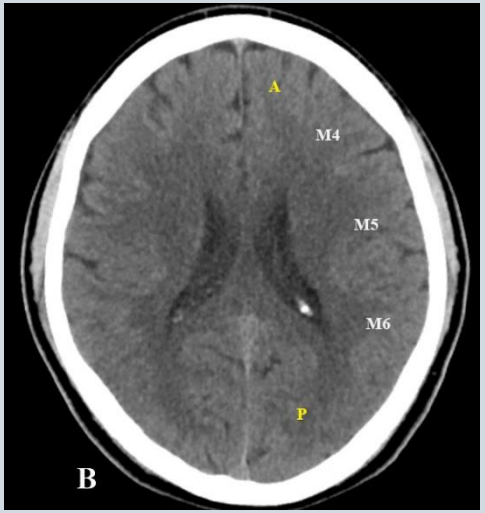
Endovascular Therapy

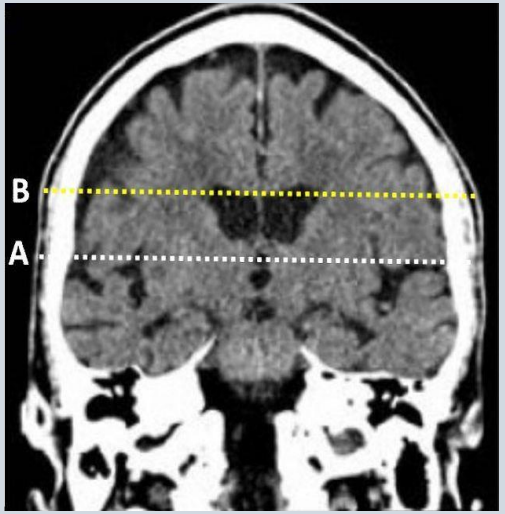
2019 Clinical Practice Guidelines (CPGs)

- Evidence of a large vessel occlusion (LVO): CTA/CTP
- NIHSS score ≥ than 6
- ASPECTS score ≥ than 6
- Clinical exam, pre-morbid condition (mRS 0-2)
- Collateral blood flow imaging
- LKN within the last 6 hours
- Patient may or may not have received IV fibrinolytic
- DAWN eligibility 6 – 24 hours for anterior circulation strokes
- Consent and 18 years or older

ASPECT Score

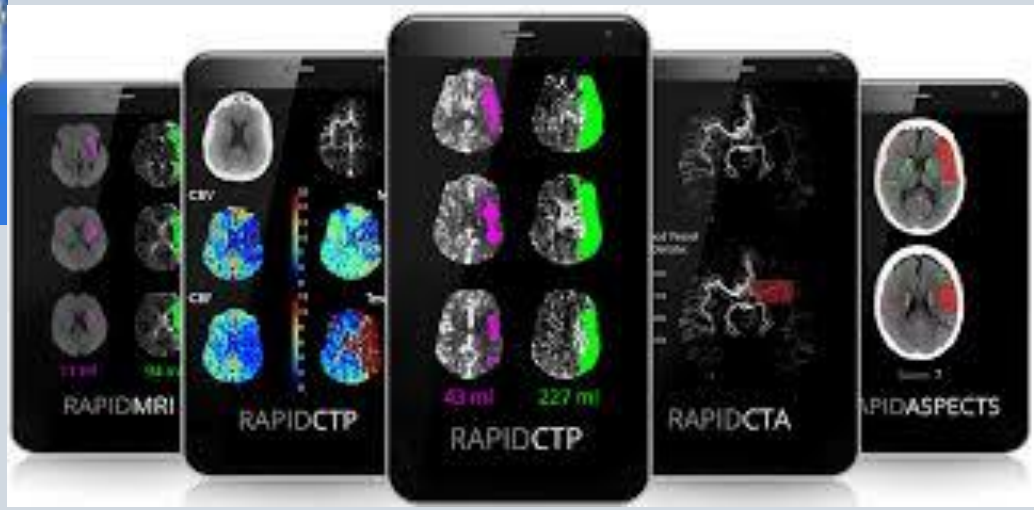






- The Alberta Stroke Program Early CT score (ASPECTS) is a 10-point quantitative topographic CT scan score used in patients with middle cerebral artery (MCA) stroke
- Segmental assessment of the MCA vascular territory is made and 1 point is deducted from the initial score of 10 for every region involved
- An ASPECTS score less than or equal to 7 predicts a worse functional outcome at 3 months as well as symptomatic hemorrhage

Artificial Intelligence (AI)



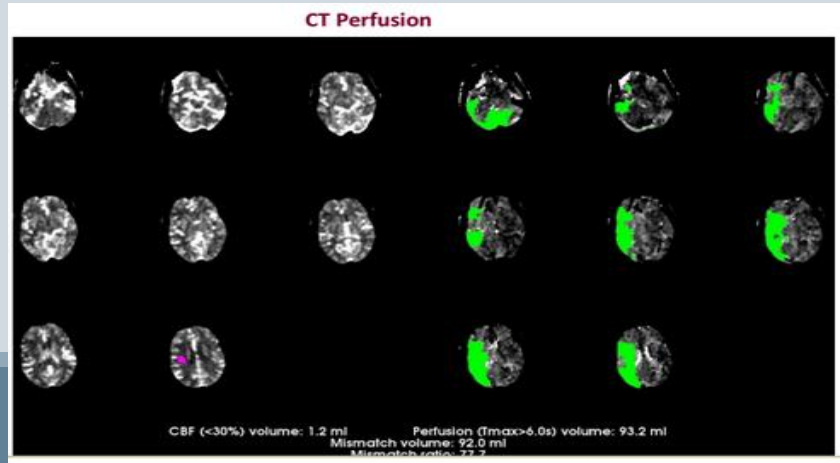
Intraarterial (IA) Thrombolysis (Alteplase)

- Window is ≤ 6 hours
- Delivered directly into the clot
- Goal: open the artery to restore blood flow
- Option for arriving ≥ 4.5 hours after onset
- Fewer side effects, smaller doses
- Off-label, not approved by FDA

Endovascular Therapy (EVT)

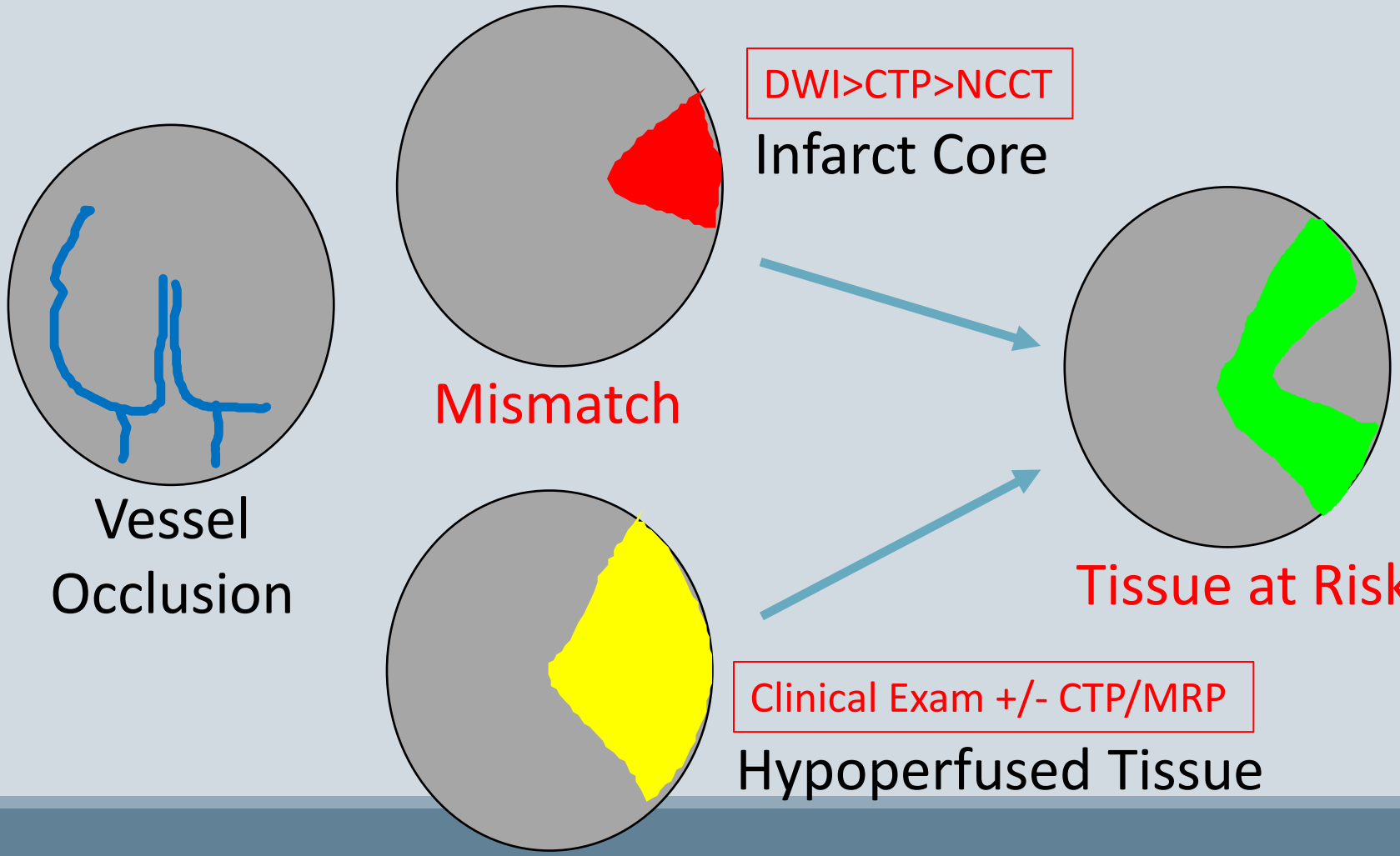
- Proximal artery occlusion (ICA, MCA, VB)
- Fast Reperfusion is key
- Salvageable Tissue
- Perfusion Imaging: Green = Penumbra; Red = Core
- Malignancy profile – mismatch
- Small Core/Large Penumbra = Optimal Reperfusion
- Collateral blood flow extends time window

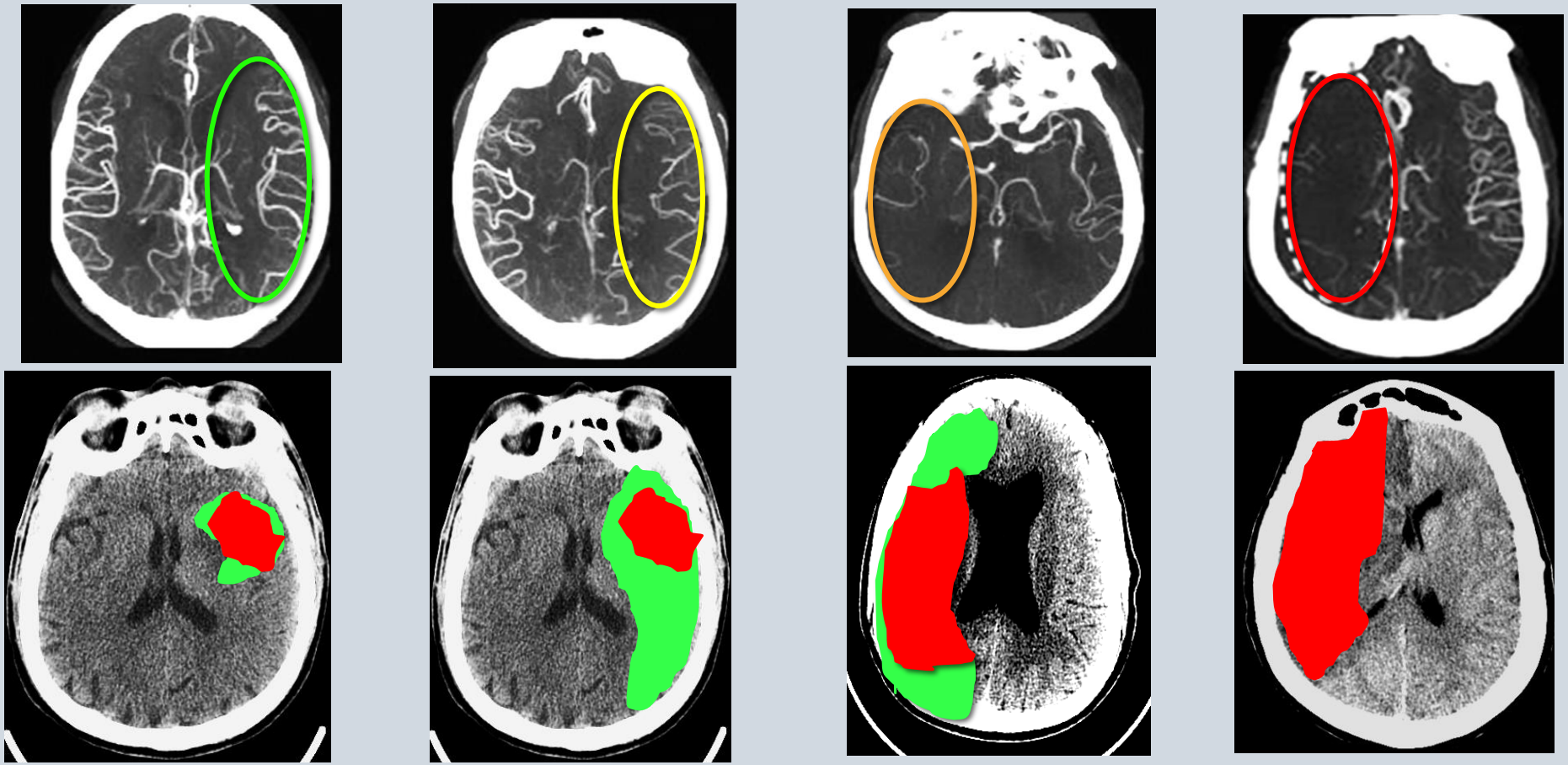
"Tissue is the Issue"



Mismatch vs. Penumbra Basic Concept

Pathophysiology-Based Decisions





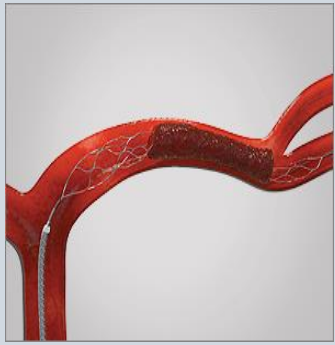
Clinical and Imaging Spectrum of MCA-M1 Occlusion of Similar Duration

Collateral Strength

NIHSS 5	**NIHSS 25**	**NIHSS 18**	**NIHSS 25**
ASPECTS 8	**ASPECTS 8**	**ASPECTS 4**	**ASPECTS 3**
Small Perfusion Defect	Large Perfusion Defect	Large Perfusion Defect	Large Perfusion Defect
Small Infarct	Small Infarct	Large Infarct	Large Infarct
Small Mismatch	Large Mismatch	Small Mismatch	No Mismatch

Interventional Neuroendovascular Procedures

- Performed in a biplane angio suite
- Door to puncture ≤ 75 mins; Door to device ≤ 90 mins
- Monitored Anesthesia Care (MAC) or General Anesthesia
  - Operator preference or patient dependent
- Wires and micro catheters reach and retrieve the clot
- Recovery in PACU or ICU



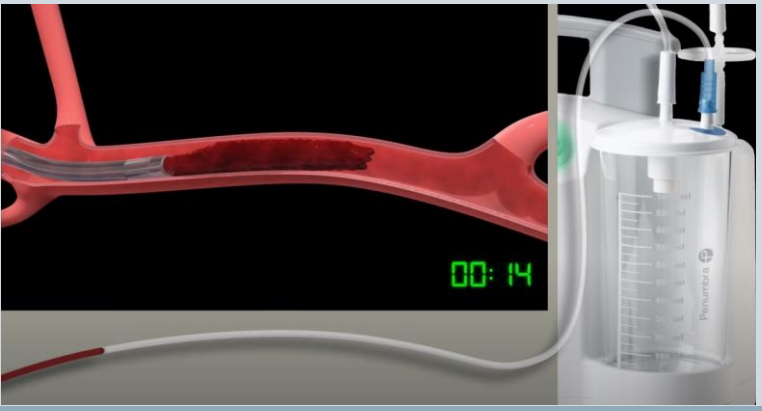
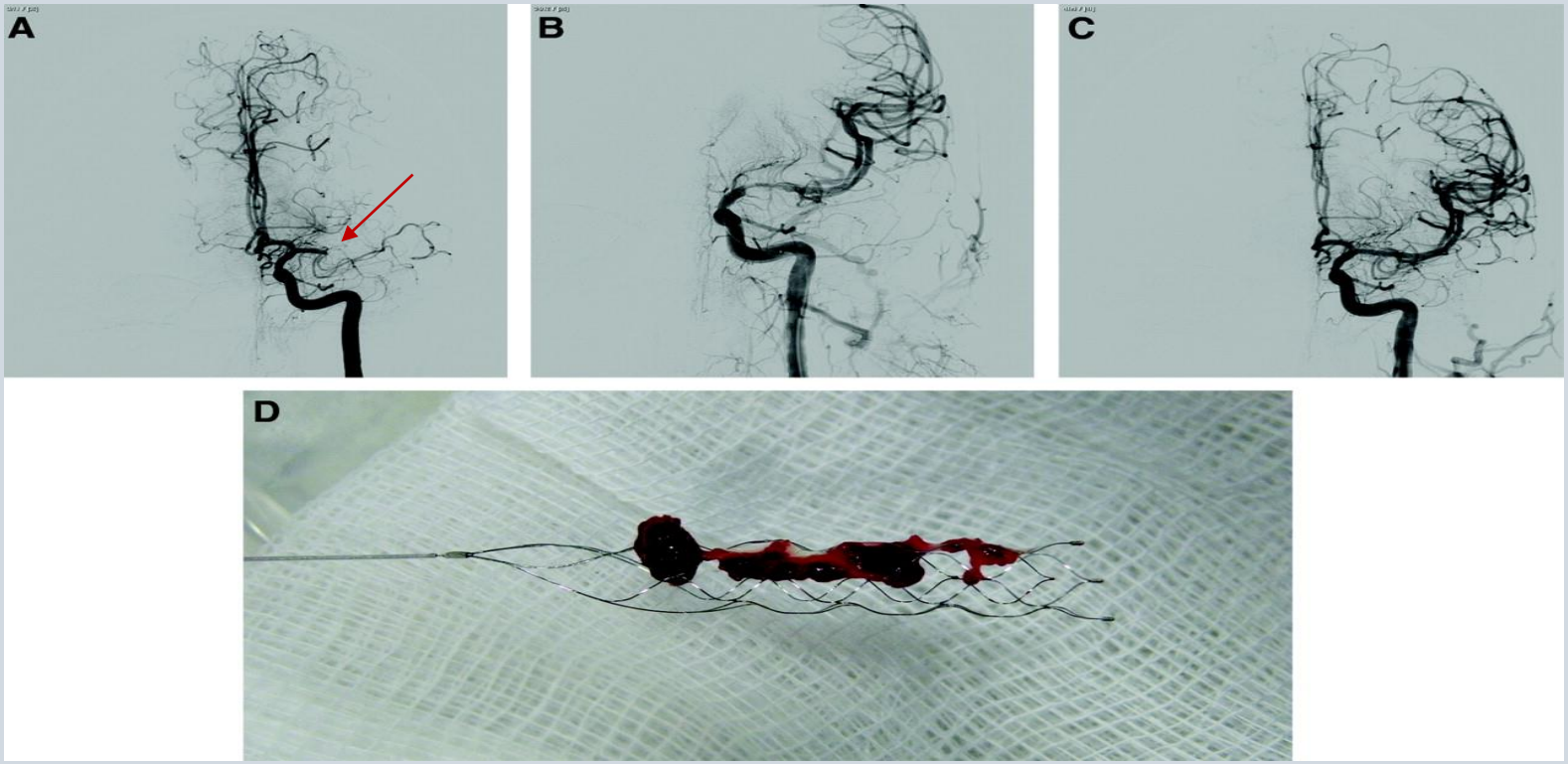


Table 1 **The proposed modified TICI score**

Score	Revised Thrombolysis in Cerebral Infarction Scale
0	No perfusion or anterograde flow beyond site of occlusion
1	Penetration but not perfusion. Contrast penetration exists past the initial obstruction but with minimal filling of the normal territory
2	Incomplete perfusion wherein the contrast passes the occlusion and opacifies the distal arterial bed but rate of entry or clearance from the bed is slower or incomplete when compared to non-involved territories
2A	Some perfusion with distal branch filling of <50% of territory visualized
2B	Substantial perfusion with distal branch filling of ≥ 50% of territory visualized
2C	Near complete perfusion except for slow flow in a few distal cortical vessels, or presence of small distal cortical emboli
3	Complete perfusion with normal filling of all distal branches

www.youtube.com/playlist?list=PL9OSt1PzZZTZw7AkYMZe-xr_oQCaimB4s

Angiogram with left MCA occlusion



American Heart Association
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Questions – Thank You

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